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ABSTRACT

This research report reflects the use of precision teaching techniques incorporated into a microcomputerized observational system to assess bilingual instructional practices and student outcomes. Three local educational agencies were monitored to assess the relationship between the demographic background of the student and the interactive profile of the teacher in relation to instruction, equity of attention, and teacher mobility. Outcomes included the student response types and his self report on understanding instructions and language used to process information. Findings suggest that the research procedures and technology used provide a broad evaluation base built upon a substantial amount of quality data. (Author)

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ASSESSING BILINGUAL INSTRUCTIONAL PRACTICES AND OUTCOMES: A PRECISION APPROACH TO AN OLD DILEMMA

Submitted as an Unsolicited Report to

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Session Number: 15.06

Abstract

Assessing Bilingual Instructional Practices and Outcomes: A Precision Approach to an Old Dilemma

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This research report reflects the use of precision teaching techniques incorporated into a microcomputerized observational system to assess bilingual instructional practices and student outcomes. Three local educational agencies were monitored to assess the relationship between the demographic background of the student and the interactive profile of the teacher in relation to instruction, equity of attention and teacher mobility. Outcomes included the student response types and his self report on understanding instruction and language used to process information. Findings suggest that the research procedures and technology used do provide a broad evaluation base built upon a substantial amount of quality data.

Assessing Bilingual Instruction of Practices and Outcomes: A Precision Approach to an Old Dilemma

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Purpose of the Research: The objective of this research is to provide a pilot assessment of bilingual instruction procedures and student/ outcomes obtained from direct observation in three Utah L.E.A.'s. Salt Lake City District, Tooele District and Weber District.

Subjects Involved in the Research: Thirteen bilingual classrooms and a staff of eight teachers were monitored in May, 1978 by a Spanish-speaking research team from the College of Education at Brigham Young University (BYU), Provo, Utah. The teacher population consisted of four English dominant, one Spanish dominant and three bilingual teachers. Student population consisted of 408 students having an ethnic breakdown of 301 Anglo, 87 Hispanic and 20 Black students.

Methods Employed in the Research: The eight teachers were observed in their classrooms using a microcomputer observational system. Teacher/ learner behaviors were both qualitatively and quantitatively recorded. The system called TICOR is a portable unit the size of an attache' case that contains a 48-button keyboard, a microprocessor, and a cassette recorder. Adjunct to the system are individual student response pads for the recording of student covert behavior. The TICOR keys were coded to represent distinct teacher/learner behaviors. The unit also recorded the learner's self reporting from the self-response pads. Each key press and key release was recorded on a cassette tape. The cassette data was analyzed using a series of computer programs that provided data on the frequency, duration, latency, simultaneity of single events including the natural recurring patterns of teacher/ learner behaviors, including the learner's self report on understanding and language use to process the information.

There were three major classroom observation formats used to gather TICOR data: 1) INSTAT or the relationship of teacher instruction to attention to students, 2) EQUAT or equity of teacher attention to individual students, and 3) MOBAT or the relationship of teacher mobility to attending individual students.

Teacher/student demographic data was entered into the data bank in order to obtain a rich contextual analysis of the classroom interaction data. Teacher information included ethnic background, language dominance, sex, grade taught and their school district. Student information included ethnic background, country of birth, language dominance in the

home, sex, teacher estimate of student scholastic ability, pupil number, and his covert response pad number, where applicable.

Major Findings of the Research: Findings suggest that the research procedures and technology used in this bilingual assessment do provide a board evaluation base that is built upon a substantial amount of quality data. This allows for an extensive analysis capability which will answer many assessment and/or evaluation questions. Representative questions assessed include: 1) What language do students use in making oral responses in various instructional, routine and free time situations in the classroom? 2) What language do students use to think with during routine instructional and free time activities in the classroom? 3) What is the percentage of usage of both Spanish and English in the various activities in the bilingual classroom? 4) How do bilingual, Spanish dominant and English dominant teachers in bilingual programs compare in the following areas: the quality and types of attention given to student of both sexes and various ethnic groups. Language usage in various instructional, routine and free time activities. The provision for response opportunities for students of both sexes and various ethnic groups. Question strategy employed and types of student responses obtained.

Unique Aspects of Research: Multiple analyses were carried out on these TICOR data in order to assess the bilingual profile of these three districts. Since all the teacher/pupil variables were being recorded in ratio form, many standard statistical techniques were utilized. Such procedures include discriminant analysis, analysis of variance and covariance, canonical correlation analysis, contingency tables and related measures of association and description of sub-population and mean difference testing. In addition, specialized analyses were developed to process these data. They include comparison of profiles between two groups or an individual and a group, sequence clustering of the interaction events and markov matrices. These procedures provide a very promising research and evaluation design for conducting a comprehensive evaluation of bilingual instructional outcomes.

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INTRODUCTION

This report deals with a pilot assessment of elementary grade bilingual instructional activities obtained from direct observation in three Utah L.E.A.'s, Salt Lake City District, Tooele District and Weber. Thirteen bilingual classrooms and a staff of eight teachers were monitored in May 1978 by a Spanish-speaking research team from the College of Education at Brigham Young University (BYU), Provo, Utah. Monitoring was carried out through the use of a microcomputer data gathering system developed at BYU, and referred to in this report as the TICOR system (Timed Interval Categorical Observational Recorder).

Multiple analyses were carried out on these TICOR data in order to assess the bilingual profile of these three districts. This project was supported from funds obtained from the College of Education at BYU and the Eyring Research Institute (E.R.I.), Provo, Utah.

Findings suggest that the research procedures and technology used in these assessments provide a broad data base built on a substantial amount of high quality data which will allow extensive analysis to answer many assessment and/or evaluation questions. Representative questions include:

1. What language do pupils use in making oral responses in various instructional, routine and free time situations in the classroom?
2. What language do pupils use to think with during routine instructional and free time activities in the classroom?

TICOR OBSERVERS, DR. JAMES YOUNG AND DR. RUSSELL BISHOP,
CONFERRING ON OBSERVATION PROCEDURES ON TICOR
DATA GATHERING SYSTEM

(TIMED INTERVAL CATEGORICAL OBSERVATION RECORDER)

3. What is the percentage of usage of both Spanish and English in the various activities in the bilingual classroom?
4. How do bilingual, Spanish dominant and English dominant teachers in bilingual programs compare in the following areas:
   A) The equity and types of attention given to pupils of both sexes and various ethnic groups,
   B) Language usuage in various instructional, routine and free time activities,
   C) The provision for response opportunities for pupils of both sexes and various ethnic groups,
   D) Question Strategy employed.

PROCEDURES FOR GATHERING DATA IN THE CLASSROOM

The three bilingual districts in the study were Salt Lake City School District, Weber County School District, and Tooele County School District.

Teacher/pupil demographic data were obtained from the teachers for a contextual analyses of the classroom interaction data. Teacher information included ethnic background, language dominance, sex, grade taught and their school district. Pupil information included ethnic background, country of birth, language dominance in the home, sex, teacher estimate of student scholastic ability, pupil number, and his covert response pad number, where applicable. Tables I and 2 provide demographic information concerning pupils and teachers.

Table 1 shows that a total of 408 students were observed

which included 301 Anglo, 87 Hispanic and 20 Black students. Only two were from outside the United States. Slightly more than 90 percent

TABLE 1

INFORMATION CONCERNING PUPILS BY NUMBERS AND PERCENTAGE IN VARIOUS DEMOGRAPHIC CATEGORIES

District	Ethnic			Pupil Origin		Lang. Dom in home		Sex		Teacher Estimate of Ability			Total
	Ang	Hisp.	Bla	U.S.	Others	Eng	Spa	Male	Female	High	Mid	Low	
Salt Lake City	46 (58) [11]	32 (41) [8]	1 (1) [.2]	77 (93) [19]	2 (2) [1]	68 (86) [17]	11 (14) [3]	40 (51) [10]	39 (49) [10]	29 (37) [7]	34 (43) [8]	16 (20) [4]	79
Weber	138 (72) [34]	38 (20) [9]	16 (8) [4]	192 (100) [47]	0 (-) [-]	182 (95) [45]	10 (5) [2]	96 (50) [23]	96 (50) [23]	70 (37) [17]	79 (41) [19]	43 (22) [11]	192
Tooele	117 (86) [29]	17 (12) [4]	3 (2) [.8]	137 (100) [23]	0 (-) [-]	119 (87) [29]	18 (13) [4]	68 (49) [17]	69 (51) [17]	41 (30) [10]	70 (51) [17]	26 (19) [7]	137
Totals	301	87	20	406	2	369	39	204	204	140	183	85	408

Numbers in parenthesis ( ) indicate percentage of pupils in category in particular LEA

Number in brackets [ ] indicate percentage of total sample in that category

Percentages are rounded to nearest percent.

TABLE 2

TEACHER INFORMATION BY DISTRICT, ETHNICITY, LANGUAGE DOMINANCE, AND SEX

District	Ethnicity		Language Dominance			Sex
	Anglo	Hispanic	English	Spanish	Bilingual	Female
Salt Lake City	0	3	0	1	2	3
Weber	0	2	1	0	1	2
Tooele	3	0	3	0	0	3

were considered English dominant with that language being used in the home. The remaining 10 percent of the pupils were from homes where Spanish was the dominant language and were, therefore, considered Spanish dominant. The total sample, by chance, was evenly divided between male and female with 204 pupils of each sex. The sample includes 79 pupils from Salt Lake City schools, 192 from Weber County schools, and 137 from Tooele County schools.

Basic to the data gathering effort is the TICOR Observational System on which teacher/learner behaviors can be both qualitatively and quantitatively recorded on a microcomputer observational system. TICOR is a compact unit the size of an attaché case that contains a 48-button keyboard, a microprocessor, and a cassette recorder. Adjunct to the system are individual pupil response pads for the recording of covert behavior. TICOR keys are coded to represent distinct teacher/learner behaviors. The unit also records the learner's self reporting from the self-response pads. Each key press and key release is recorded on the cassette tape. The cassette is then analyzed with a series of computer programs to provide data on the frequency, duration, latency, simultaneity of events, and the natural recurring patterns of the teacher/learner behaviors, including the learner's self report provided by input from the pupil response pads.

FORMATS FOR GATHERING DATA

There were three major classroom observation formats used to gather TICOR data: INSTAT or attention to instruction, EQUAT or equity of teacher attention to individual pupils, and MOBAT or the relationship of teacher mobility to attending individual pupils.

Explanation of INSTAT Procedures

INSTAT is a procedure designed to identify instructional strategies the teacher uses when interacting with pupils in the classroom. The keyboard for INSTAT was configured as shown in Figure 1. The primary focus of INSTAT was teacher/pupil language usage being classified as either Spanish or English. If the language used could not be determined, the observer recorded the event as "unknown."

Teacher instruction was classified under the following categories: explaining, questioning, directing, praising, punishing, and informing. A third classification indicated if the teacher's instructional strategy occurred outside of an instructional mode (see Figure 2). This was designated as being either free time or a routine mode.

Where applicable, the teacher's language usage was classified as being either Spanish as a second language (SSL) or English as a second language (ESL) instruction.

Pupil responses were classified as being given in either English or Spanish or unknown. Types of pupil response were: correct incorrect, partially correct, no response, or pupil asks a question.

The observational unit in INSTAT procedure was the pupil. The particular pupil under observation was designated as the "target pupil" with all others being identified as "other pupil".

Six pupils randomly selected and designated as the "target pupil" were observed for two or more five-minute periods. These pupils were the same pupils who received the six pupil response pads (see Figures 3 and 4). This procedure allowed for an analysis between teacher interaction with the target pupil and his covert response patterns.

KEY SWITCH FORM

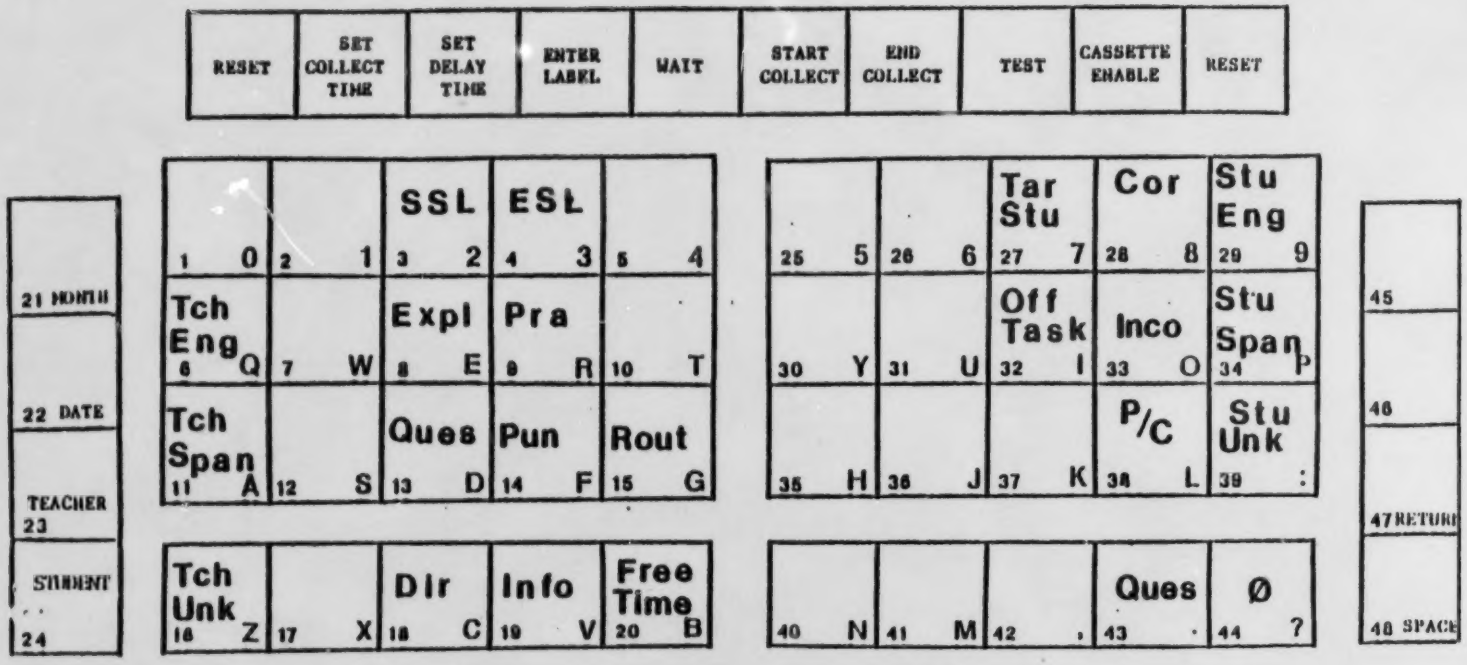

FIGURE 1

This model, when reduced in size can be used as insertions for TICOR keys. Words or symbols can be typed on each square. Approximately 3 lines vertically and 8 letters horizontally can be used. The model should be reduced approximately 139 percent of normal. This can be done by reducing it 65 percent and then reducing that copy 74 percent. Color can be added with felt tip markers etc. after reduction.

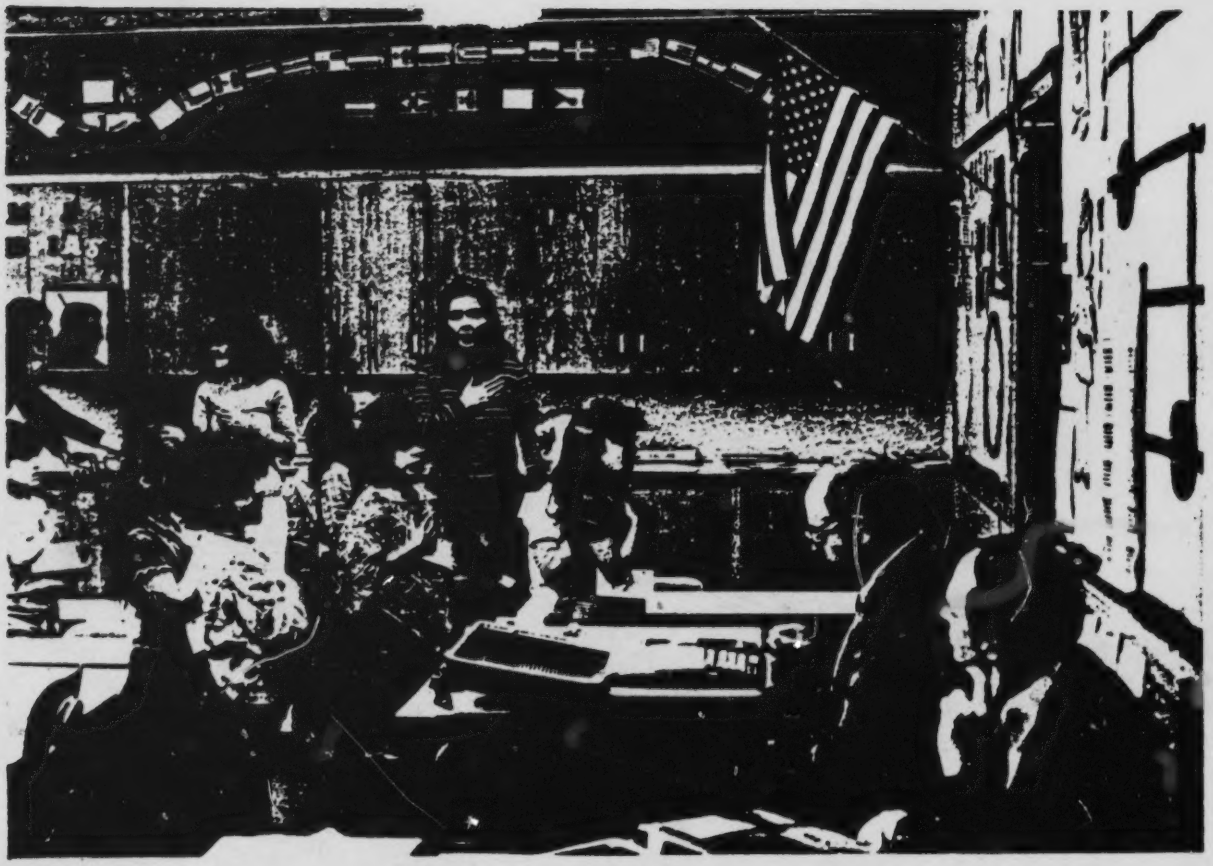

FIGURE 2

ROUTINE ACTIVITY BEING MONITORED BY TWO OBSERVERS
USING INSTAT AND EQUAT PROCEDURES

FIGURE 3

INSTAT OBSERVER RECORDING DATA DURING A FIVE MINUTE
OBSERVATIONAL PERIOD USING THE
PUPIL RESPONSE PAD SYSTEM

FIGURE 4

TEACHER/PUPIL INTERACTION DURING A FIVE MINUTE
INSTAT OBSERVATION PERIOD

The pupil response pad system was used to obtain data on the covert disposition of the learner (see Figure 5). Pupil key response training was provided by the INSTAT observer. In the case of the lower grades, this training contained detailed, repeated explanations and opportunity for practice in using the response key pads. In the Salt Lake City and Tooele Districts, the keys were identified as "I understand what the teacher is saying," a smiling face, and "I do not understand what the teacher is saying," a frowning face. In the Weber District, the response pad keys were used to monitor in what language the pupils were thinking: "I am thinking in Spanish," "Si," and "I am thinking in English," "Yes."

During the training period, the TICOR Analysis Computer (TAC) was used to provide feedback to the observer to validate the training results (see Figure 6). From this it was possible to determine if a pupil response was a function of random playing with the keyboard or that which represented a carefully considered response. A second validation procedure was carried out through a series of random interviews conducted by an observer with each target pupil. Here a pupil was asked to state his reasoning behind a given response made on the pupil's pad.

At regular intervals throughout an observed instructional routine or instructional period, the observer elicited, via his master control pad, pupil responses from their pads. These usually followed a teacher question or a teacher explanation.

Explanation of the EQUAT Procedure

Equat is a contraction of "equity of teacher attention" to an individual pupil. Recent ethnographic studies on teacher effectiveness

FIGURE 5

PUPIL RESPONDING TO OBSERVER'S PROMPT
ON PUPIL RESPONSE PAD

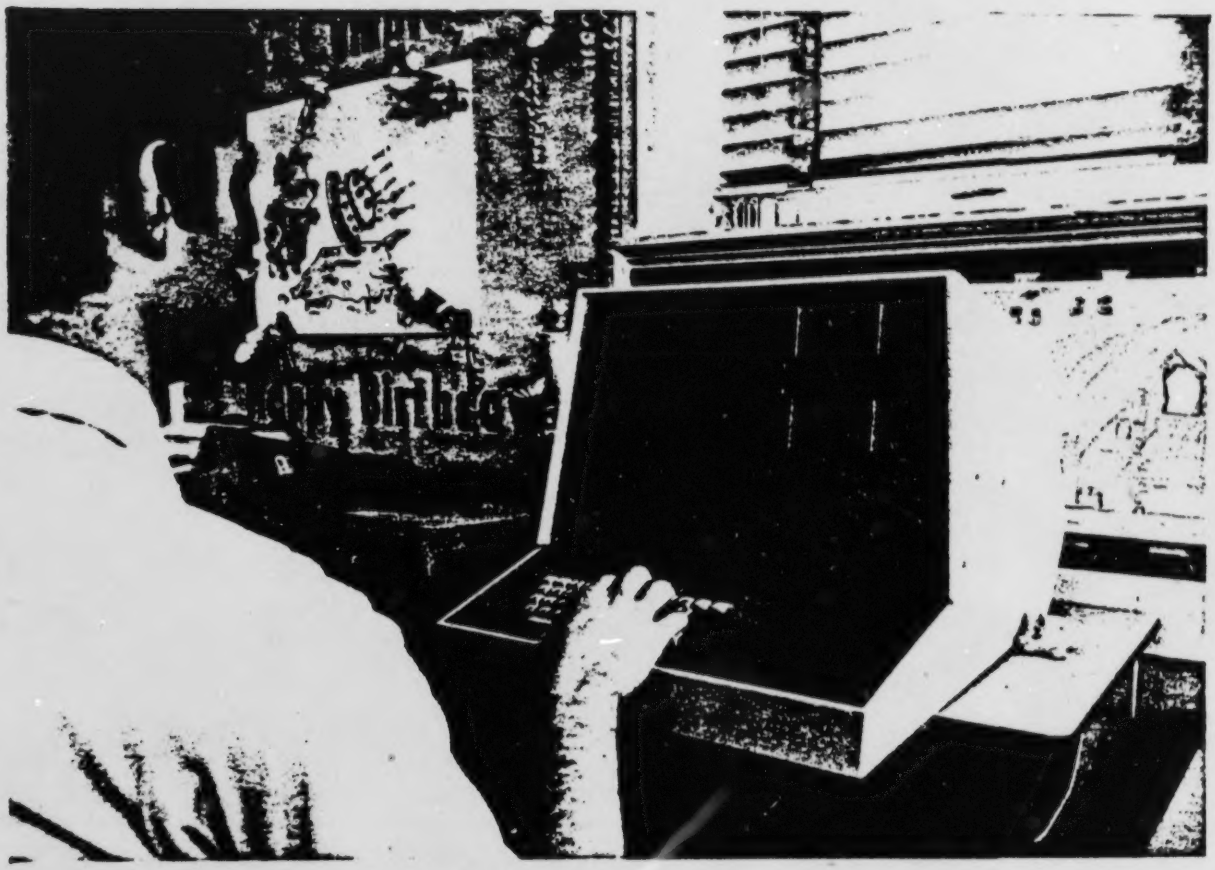

FIGURE 6

TICOR ANALYSIS COMPUTER BEING USED
TO VALIDATE PUPIL RESPONSES

conducted at the Farwest Laboratory for Educational Research and Development suggest that equity of attention is a teacher quality more frequently found in an effective teacher's profile than in his less effective counterpart.

To facilitate data collection, each pupil was labeled with a numbered sandwich board making it possible to monitor a pupil each time he was observed interacting on an individual basis with his teacher. Each pupil had an assigned key on the TICOR keyboard. Attention to the pupil was categorized in two ways: (1) when the pupil initiated the attention and (2) when the teacher initiated the attention. The quality indicators of attention included off task attention, positive attention, negative attention, and teacher proximity to pupil. The pupil key was used to obtain duration of attention. The keyboard lay-out for EQUAT is shown in Figure 7.

Pupil numbering was used contextually to reflect seating position and a demographic identification. The power of these two conditions in assisting the educator to obtain a profile on individual and group learning is discussed later in this report.

Explanation of the MOBAT Procedure

The MOBAT procedure, teacher mobility and attention, was also based on research done at the Farwest Laboratory for Educational Research. Similar to equity of teacher attention, their findings suggest that teacher mobility in moving about the classroom while attending to an individual is an indicator of teacher effectiveness, especially in the lower grades.

In this procedure, the classroom was organized into 12 separate, distinct regions: front of the room, back of the room, teacher's desk

KEY SWITCH FORM

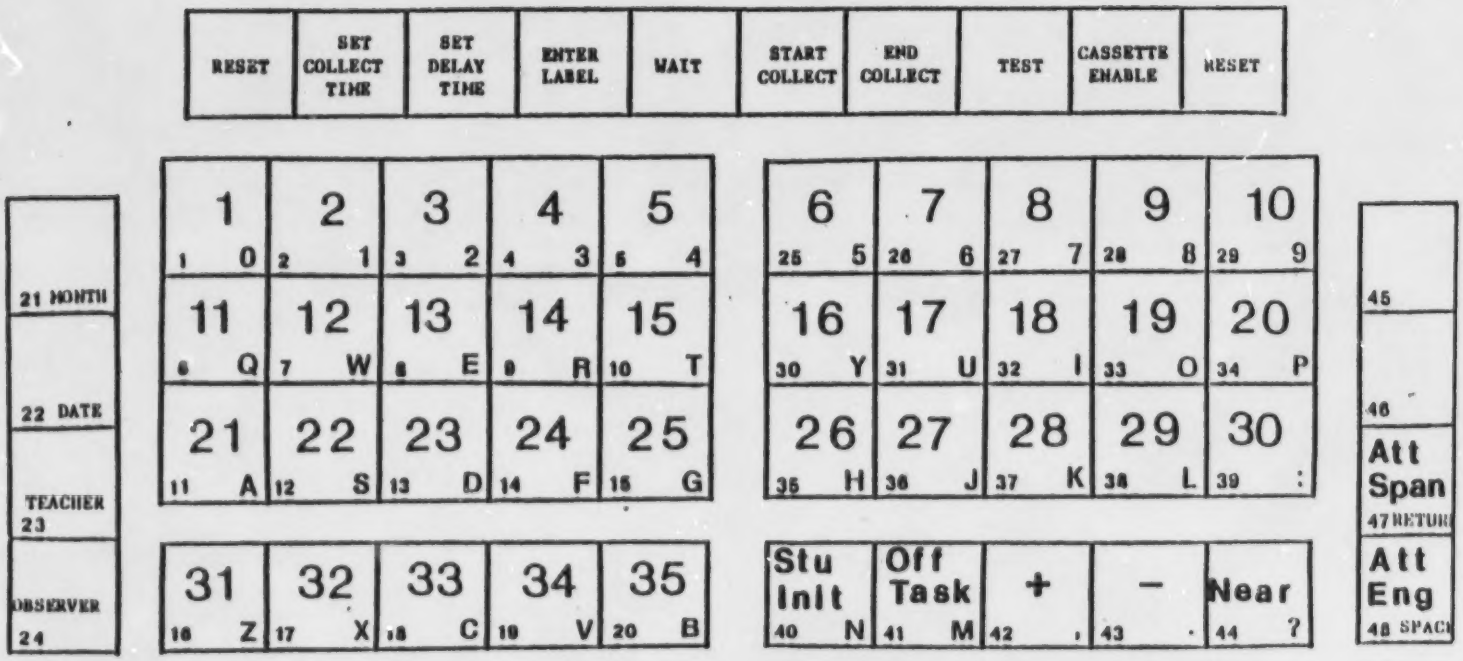

FIGURE 7

This model, when reduced in size can be used as insertions for TICOR keys. Words or symbols can be typed on each square. Approximately 3 lines vertically and 8 letters horizontally can be used. The model should be reduced approximately 139 percent of normal. This can be done by reducing it 65 percent and then reducing that copy 74 percent. Color can be added with felt tip markers etc. after reduction.

EQUAT

15

area, and the pupil seating areas one through nine. In order to gather these data, the TICOR keyboard was divided into four areas. The first set of 12 keys dealt with the teacher position, front, desk, back, and pupil seating positions one through nine. Two other sets designated the female pupil position and the male pupil position (see Figure 8). The fourth set dealt with the quality of teacher attention: positive attending, negative attending, non-verbal attending, off task attending, attending in English or attending in Spanish. Each area was color-coded to facilitate data collection.

The procedure used in recording a MOBAT observation was to first identify the teacher position at the time the teacher was attending to an individual pupil then the pupil position by sex and the quality of the interaction and the language stimulus was recorded. Duration of attention was obtained by holding the teacher position key down during the length of the interaction. This enabled the researcher to monitor the amount of time a teacher spends in attending to an individual pupil in each of the 12 regions of the room. The teacher/pupil coordinate recorded information on the near/far relationship of the interaction.

KEY SWITCH FORM

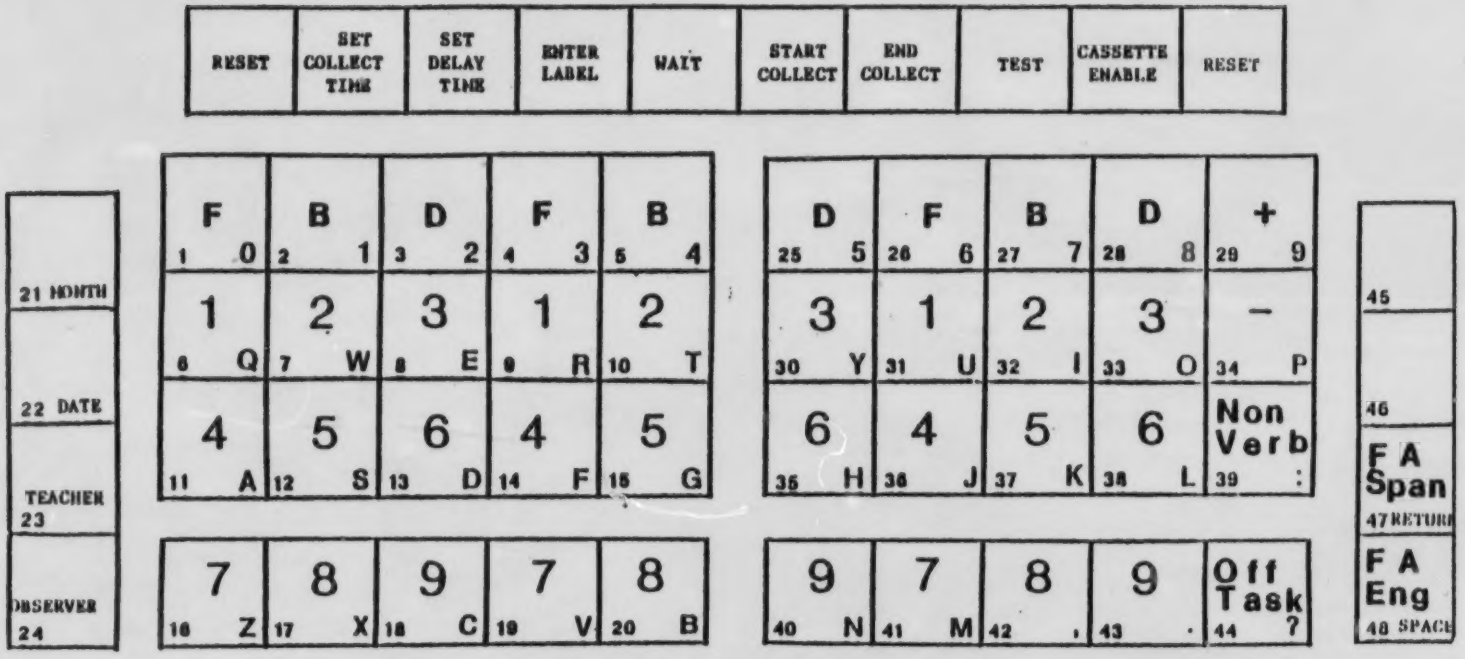

FIGURE 8

This model, when reduced in size can be used as insertions for TICOR keys. Words or symbols can be typed on each square. Approximately 3 lines vertically and 8 letters horizontally can be used. The model should be reduced approximately 139 percent of normal. This can be done by reducing it 65 percent and then reducing that copy 74 percent. Color can be added with felt tip markers etc. after reduction.

MOBAT

ANALYSIS OF INSTAT DATA

Introduction

The INSTAT procedure was designed to carefully monitor language interactions between the teacher and her pupils in a bilingual classroom. Sample classrooms were selected from three school districts which were operating bilingual classrooms. Salt Lake City School District provided three classroom settings with three different teachers; Tooele School District, three teachers in five settings; and Weber School District with two teachers in five settings.

Each teacher was observed during instructional, routine and free time teaching activities. The observer observed at five minute intervals the language behavior of one of sex randomly selected target pupils.

When the teacher specifically directed his behaviors to another pupil other than the target pupil, the observer would record this other pupil's language behaviors.

The first part of the INSTAT analysis deals with the teachers and pupils usage of Spanish and English in the classrooms. The second part deals with two specific kinds of mediating patterns of the pupils; the third, the different communicatory and instructional patterns of the teachers and pupils.

PART I

Pupil Responses

In looking at language usage within each of the three districts, Table 3 indicates that pupils observed in the Salt Lake School District used English for making oral responses at a higher rate than those

TABLE 3
SUMMARY RATES, MEAN DURATIONS, AND PERCENTAGES
OF TEACHER AND PUPIL LANGUAGE USAGE
BY THREE SCHOOL DISTRICTS

Group, Language and Activity	Salt Lake City			Tooele			Weber		
	Resp/ Min	Mean Duration	% Resp.	Resp/ Min	Mean Duration	% Res	Resp/ Min	Mean Duration	% Resp.
Teacher - English	5.21	3.05	74%	0.42	3.74	12%	3.11	2.55	35%
-(SSL)	(.04)	(4.38)	(1%)	-	-	-	-	-	-
Instruction									
unmodified -	3.76	2.73	72%	0.26	2.48	62%	2.64	2.54	85%
modified -	1.33	3.72	26%	.02	3.80	6%	.47	2.65	15%
Routine	.08	6.19	1%	.11	5.52	29%	-	-	-
Free Time	-	-	-	.01	13.6	3%	-	-	-
Teacher - Spanish	1.83	5.25	26%	3.04	4.88	88%	5.67	2.07	65%
- (SSL)	(.09)	(5.68)	(5%)	(0.17)	(5.39)	(6%)	-	-	-
Instruction									
unmodified	1.04	5.29	57%	1.48	3.58	49%	4.42	2.00	78%
modified	1.68	5.03	37%	.91	5.22	30%	1.24	2.14	22%
Routine	.02	8.33	1%	.02	4.65	1%	.01	3.2	0%
Free time	-	-	-	.45	8.28	15%	.01	25.7	0%
Target Pupil									
English	.05	2.29	50%	0.01	7.80	14%	-	-	-
Spanish	.05	3.86	50%	0.07	4.02	86%	0.13	1.60	100%
Other Pupil									
English	3.82	2.53	86%	0.92	2.56	42%	1.12	1.15	24%
Spanish	0.63	2.69	14%	1.27	3.18	58%	3.64	1.19	76%
Pupils Combined									
English	3.87	2.52	85%	.93	2.62	41%	1.12	1.15	23%
Spanish	.68	2.77	15%	1.34	3.23	59%	3.77	1.21	77%

TABLE 4
SUMMARY RATES AND MEAN DURATIONS OF SPECIFIC CLASSROOM TEACHER AND PUPIL LANGUAGE BEHAVIORS BY THREE SCHOOL DISTRICTS

VARIABLE	Salt Lake City		Tooele		Weber	
	Resp/ Min	Mean Duration	Resp/ Min	Mean Duration	Resp/ Min	Mean Duration
Null time	9.29	2.69	4.46	9.39	12.95	2.78
Teacher English	3.76	2.73	0.26	2.48	2.64	2.54
Teacher English SSL	0.04	4.38	-	-	-	-
Tch Eng Explains Inst	0.32	5.61	0.01	3.30	0.08	3.49
Tch Eng Questions Inst	0.56	3.09	0.01	4.30	0.28	2.22
Tch Eng Directs Inst	0.15	3.14	-	-	0.01	4.00
Tch Eng Praises Inst	0.09	1.83	-	-	0.03	2.93
Tch Eng Punishes Inst	0.11	5.49	-	-	0.06	3.20
Tch Eng Informs Inst.	0.11	2.05	-	-	0.02	2.75
Tch Eng Explains Routine	0.01	10.05	0.05	7.40	-	-
Tch Eng Questions Rout	0.01	5.25	0.02	2.85	-	-
Tch Eng Directs Rout	0.04	4.23	0.04	3.80	-	-
Tch Eng Informs Rout	-	-	0.01	8.50	-	-
Tch Eng Punishes Rout	0.01	9.15	-	-	-	-
Tch Eng Questions FRIM	-	-	0.01	13.60	-	-
Teacher Spanish	1.04	5.29	1.48	3.58	4.42	2.00
Tch Spanish SSL	0.09	5.68	0.17	5.39	-	-
Tch Span Explains Inst	0.20	4.28	0.36	7.90	0.29	2.17
Tch Span Questions Inst	0.15	4.80	0.36	3.59	0.74	1.88
Tch Span Directs Inst	0.18	7.69	0.07	3.30	0.05	2.60
Tch Span Praises Inst	0.07	2.42	0.10	3.01	0.07	1.76
Tch Span Punishes Inst	0.01	2.50	0.01	2.80	-	-
Tch Span Informs Inst	0.07	4.11	0.01	5.10	0.09	4.39
Tch Span Explains Rout	0.01	9.95	0.01	4.00	-	-
Tch Span Questions Rout	-	-	0.01	5.30	-	-
Tch Span Punishes Rout	0.01	3.10	-	-	0.01	3.20
Tch Span Explains FRIM	-	-	0.06	10.04	0.01	25.70
Tch Span Questions FRIM	-	-	0.37	7.82	-	-
Tch Span Directs FRIM	-	-	0.02	11.10	-	-
Tch Lang Unknown	-	-	0.05	0.37	0.03	0.13
Target Pupil English	0.01	1.00	-	-	-	-
Target Pupil Eng Correct	0.02	1.20	0.01	7.80	-	-
Target Pupil Eng Incorr	0.01	3.00	-	-	-	-
Target Pupil Eng Off Tas	0.01	4.20	-	-	-	-
Target Pupil Spanish	0.05	3.86	0.04	2.73	0.12	1.11
Target Pupil Span Correct	-	-	0.04	5.30	0.01	8.00
Target Pupil Unknown	-	-	0.01	4.40	-	-
Target Pupil No Response	0.02	2.23	0.02	1.35	-	-
Other Pupil English	2.76	2.24	0.55	2.26	0.97	1.08
Other Pupil Eng Correct	0.89	3.45	0.33	3.00	0.10	1.65
Other Pupil Eng Incorrect	0.10	2.11	0.01	2.60	0.02	2.00
Other Pupil Eng Part Cor	-	-	-	-	0.02	1.20
Other Pupil Eng Question	0.01	2.10	-	-	0.01	1.00
Other Pupil Eng Off Task	0.06	2.82	0.02	3.30	-	-
Other Pupil Spanish	0.24	1.90	0.45	1.61	3.44	1.15
Other Pupil Span Correct	0.38	3.21	0.75	4.15	0.18	1.58
Other Pupil Span Incorr	0.01	1.50	0.02	3.65	-	-
Other Pupil Span Question	-	-	-	-	0.01	3.00
Other Pupil Span Off Task	-	-	0.04	2.47	0.01	5.10
Other Pupil Unknown	0.05	2.31	-	-	0.02	0.15
Other Pupil No Response	0.06	1.64	-	-	0.03	0.47

pupils observed in the other districts. Specifically, Salt Lake City pupils had a response rate of 3.87 English language responses per minute, while Tooele and Weber had a response rate of .93 and 1.12 respectively. On the other hand, those pupils observed in the Weber School District had the highest rate of pupil oral response in Spanish, 3.77 per minute.

Table 4 presents a further breakdown of the specific kinds of pupil language responses by the target pupil and the other pupils. Salt Lake City target pupils had the highest rates of correct responding in English at a rate of .02 (two correct responses in English every 10 minutes). Salt Lake's other pupils also had the highest rate of correct English responses at .89. Whereas, Tooele's target pupils had the highest rate of correct Spanish responses with a rate of .04. Weber's overall rate of unmodified Spanish responses for observed other pupils was highest at 3.44 responses per minute. Tooele's other pupils had the highest rate of Spanish oral language responses classified as correct (.75). And at the same time, they also had the highest rate of incorrect Spanish responses for other pupils (.02).

Table 4 further indicates the average duration of the pupil language responses. Note that even though Salt Lake City's overall rate of pupil usage of Spanish was lowest, the observed target pupils had the highest mean durations of target pupil Spanish responses. Meaning that, when the Salt Lake City target pupils were encouraged to respond in Spanish, they responded for a longer period of time than did their counterparts in the other two districts. Their average response was 3.86 seconds. Tooele's other pupils responded in Spanish with a longer language responses for correct and incorrect Spanish responses of 4.15 seconds and 3.65 seconds respectively.

Weber's other pupils were the only pupils to be observed asking questions in Spanish. They did this at a rate of one every 10 minutes (.01) and with the average length of Spanish question being three seconds.

Tooele pupils had the highest rate of off-task (inappropriate) Spanish language responses at a rate of .04. Weber's rate of off-task Spanish language responses were lower, .01. The average teacher attention in attending to an off-task behavior in this district was 5.10 seconds. Salt Lake City pupils had the highest rates of off-task English language responses.

Teacher Responses

An overall comparison of teacher usage of English and Spanish in the classroom, indicates that those observed teachers in Salt Lake City used English a greater percentage of the time than did the other two districts observed (Table 3). Salt Lake teachers used English for 74 percent of their responses, while Tooele and Weber observed teachers used English for 12 percent and 35 percent of their responses respectively. Tooele observed teachers made the most use of Spanish with 88 percent of their observed language behaviors being in Spanish. Salt Lake observed teachers were lowest in Spanish with 26 percent and Weber in the middle at 65 percent.

Table 3 gives a further breakdown of each language area showing the rate of observed teachers language behaviors during instruction, routine and free time activities, using English and Spanish as well as a percentage of language behaviors within these languages. The activity of instruction was divided into two parts, modified and unmodified. Modified refers to that instructional behavior which was classified as

being an explanation, question, praise, punish, or inform. Unmodified instructional behaviors refer to those behaviors that were not classified as one of the above.

Along with using English as the language for teaching, Tooele also had a greater percentage of language behaviors dealing with routine classroom procedures. Weber teachers, on the other hand, used no English oral behaviors during the observed time to conduct routine

Comparing the use of Spanish in the various activities indicated that the Spanish language responses for the three districts occurred mostly in the area of unmodified instruction with Weber having the highest percentage of 78 percent. Tooele observed teachers had 15 percent of their Spanish language behaviors occurring during the activity of free time. The other two districts observed teachers had little to no Spanish language behaviors during free time.

Table 4 can be used to answer more specifically the kind of instructional, routine, and free time language behavior the observed teachers used during this study.

During instructional activity, teachers observed in Salt Lake City had the highest rate of giving commands (Directs) in both English and Spanish with rates of .15 and .18 respectively. For asking questions (Questions) in English, Salt Lake had the highest rated (.56) while Weber had the highest rate for asking questions in Spanish (.74). Tooele had the highest rate of explaining during instructional activities, using Spanish as the language of instruction (.36). Tooele teachers also had the highest rates of explaining (.06), questions (.37), and directs (0.2) in Spanish during free time.

Summary

Summarizing the basic amounts and kinds of language usage between the three school districts, it can be said that observed Tooele teachers use Spanish more than the observed teachers in Salt Lake and Weber. And, the observed pupils in Weber respond more in Spanish than the other observed pupils in the other districts. Also, Salt Lake City observe teachers and pupils use English as their classroom language more than the other observed teachers and pupils. This is especially interesting when we recall that all of the teachers observed in Tooele were Anglo, and that all of the teachers in Salt Lake and Weber were Hispanic.

PART II

The second part of the INSTAT analysis reports the mediating behaviors of the pupils in the bilingual setting. To measure these inner covert behaviors, six pupils were randomly selected in each of the various classrooms being observed across the three school districts. These pupils were each given a pupil response pad with two marked keys. They were instructed to depress one of the keys when they saw the small red light on the front of the response pad go on. For Salt Lake City and Tooele, the two marked keys stood for "understand" and "don't understand". Because the study dealt with children in the lower grades, it was decided to use a "smiling face" symbol to indicate "understand", and a "frowning face" symbol to indicate "don't understand."

During instruction and following a teacher question to the group the observer signaled the pupils with the red light on their pad to respond to the question, "do you understand what the teacher is doing or saying?"

In the Weber School District, a different question was asked

the six randomly selected pupils in the several classrooms. This question asked the pupils if they were thinking in either English or Spanish. Again, the observer randomly signaled the pupils during instruction to indicate which language they were thinking in. They depressed the "SI" key if they were thinking in Spanish and the "Yes" key if they were thinking in English.

Table 5 gives a summary of these two covert behaviors. Note that observed pupils in the Tooele district bilingual classes had a greater percentage (55 percent) of "understand" responses than did the observed pupils in the Salt Lake classes (36 percent).

TABLE 5

SUMMARY OF # OF RESPONSES, RATES AND PERCENTAGES OF STUDENT RESPONSES TO UNDERSTANDING AND THINKING QUESTIONS BY THREE SCHOOL DISTRICTS

	SALT LAKE CITY			TOOELE			WEBER		
	# RESP	RESP/ MIN	% OF RESP	#RESP	RESP/ MIN	% OF RESP	#RESP	RESP/ MIN	%OF RESP
"PUPIL UNDERSTANDS?"									
UNDERSTANDS	97	.69	36	184	2.20	55			
DOESN'T UNDERSTAND	99	.70	37	73	.87	22			
NO RESPONSE	74	.52	27	79	.94	23			
"PUPIL THINKS IN?"									
THINKS IN ENGLISH							185	1.76	48
THINKS IN SPANISH							107	1.02	27
NO RESPONSE							98	.93	25

Tooele also had lowest percentage of "doesn't understand" and "no response" behaviors with 22 percent and 23 percent respectively.

The bottom of Table 5 shows that the Weber pupils thought in English for 28 percent of their keyed responses, in Spanish for 27 percent, and did not respond for 25 percent of the keyed cases.

Figure 9 presents a further breakdown of the relationship of the pupil's covert thought processes with teacher language behaviors. This figure is based on one teacher and focuses on one pupil. It is included in the analysis to show how these more exacting data can be presented graphically.

Figure 9 shows that the observer signaled the pupils five times during this five minute observation (Master Keypad Question). The actual data signal appears as a vertical slash on the bottom of the figure (these have been circled to isolate them for the reader). Going up the left hand column of variables note that Box 2 Pupil Understands has a vertical slash out to the right (circled). This indicates when the pupil depressed the "Understands" key on his desk. Going up to the top of this variable column, the reader will see TCH SPAN EXPLAINS INST and to the right of this variable, a rectangle (circled). This rectangle represents the teacher variable just listed and also the length of its occurence with relationship to the other variables (the longer the rectangle, the longer that variable occurs). Notice how the observer keyed the pupil with the question while the teacher was explaining in Spanish and then the pupil responded with "understand" at the end of the teacher's explaining. The other four

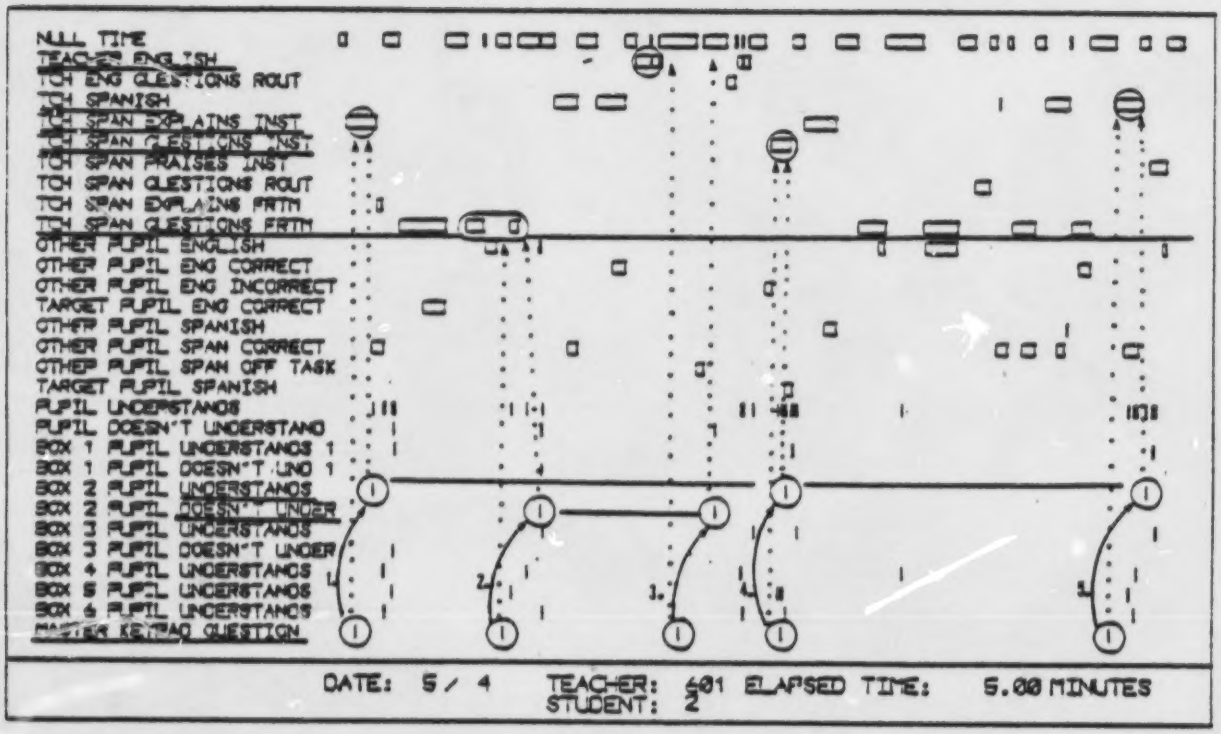

FIGURE 9

SEQUENTIAL DISPLAY OF PUPIL #2'S RESPONSES WITH RELATION TO TEACHER LANGUAGE BEHAVIORS, AND FIVE KEYED QUESTIONS OF UNDERSTANDS AND DOESN'T UNDERSTAND

signaled questions and their relationship with teacher variables and other pupils' variables can be seen by looking across this figure.

Summary

Through the use of the pupil response pads, a valid and detailed measure can be obtained concerning the covert thought processes of the pupils in relation to the language behaviors of their teachers and other students. These data can be used as a part of a larger contextual analysis of the learner's learning environment. The researcher can, through this procedure, identify those preceding events which stimulated the pupil's covert response allowing him to probe into the causability and consequence.

It is exciting to speculate how evaluation would be influenced by data such as these if collected from a large sample of L.E.A.s in the United States.

It would be a relatively simple matter to determine goal achievement in many areas in bilingual bicultural education. For example, if the goal is to have Hispanic children thinking, responding and asking questions in English preparatory to transition into mainstream English classwork, data such as these would immeasurably assist not only in determining the acquisition of these language skills in the English, but also would aid in determining the appropriate time for transition to mainstream classroom instruction in English.

PART III

The final analysis of the INSTAT data looks more closely at the specific kinds of teacher-pupil interactions to analyze if there are recurring patterns of language interactions which take place in the bilingual classroom. For this pilot study, three teachers were selected; one from each of the school districts, each with a different mastery of the English and Spanish languages. All were bilingual. From Salt Lake City, a Spanish dominant bilingual toacher was selected, from Tooele an English dominant bilingual teacher and from Weber, a bilingual teacher equally skilled in both Spanish and English was selected. For the purpose of this report, these three teachers will be referred to as "Spanish dominant", "English dominant", and "Bilingual" respectively.

Table 6 gives an overall summary comparison of the three teachers by the individual teacher and pupil language behaviors that occurred during observation. A first overview of this table indicates that the bilingual teacher from Weber had a higher rate of English behaviors in an unmodified instructional mode (3.27 per minute) than the other two teachers. Yet, this same teacher also had the highest rate of unmodified Spanish language usuage with a rate of 5.33/min compared to the Spanish dominant teacher at 2.14 and the English dominant teacher at 1.65. This would indicate that overall, the bilingual teacher had a higher rate of overall language behavior than the other two teachers.

The target pupils for the Spanish dominant teacher had the highest rate of unmodified pupil Spanish language responses at a rate of .20,

TABLE 6
SUMMARY RATES AND MEAN DURATIONS OF SPECIFIC CLASSROOM TEACHER/PUPIL LANGUAGE BEHAVIORS BY THREE TEACHERS WITH THREE DIFFERENT LEVELS OF LANGUAGE DOMINANCE

Group, Language and Activity	Biling. Span. Dom. (Salt Lake City)		Biling. Eng. Dom. (Tooele)		Biling. Span/Eng (Weber)	
	Resp/ Min	Mean Duration	Resp/ Min	Mean Duration	Resp/ Min	Mean Duration
Teacher English	1.26	6.88	.15	1.68	3.27	2.04
Tchr Eng Exp Inst	.26	10.39	-	-	.11	3.49
Tchr Eng Quest Inst	.49	5.95	.02	3.30	.29	2.21
Tchr Eng Dir Inst	.11	4.85	.02	4.30	-	-
Tchr Eng Praises Inst	.14	2.42	-	-	.01	.80
Tchr Eng Punish Inst	.11	6.70	-	-	.05	1.82
Tchr Eng Informs Inst	.09	2.33	-	-	.03	2.75
Teacher Spanish	2.14	6.16	1.65	.05	5.33	1.93
Tchr Span SSL	-	-	.30	5.78	-	-
Tchr Span Exp Inst	.14	5.76	.62	7.44	.40	2.06
Tchr Span Quest Inst	.17	5.27	.64	3.70	.85	1.79
Tchr Span Dir Inst	.49	9.37	.15	3.30	-	-
Tchr Span Praises Inst	.09	3.00	.15	1.98	.05	2.05
Tchr Span Punish Inst	.03	1.90	.02	2.80	-	-
Tchr Span Informs Inst	.17	4.47	.02	5.10	.11	4.57
Tchr Span Expl Rout	.03	8.70	-	-	-	-
Tchr Span Expl FRIM	-	-	.02	4.60	.01	25.70
Tchr Span Quest FRIM	-	-	.02	18.20	-	-
Tchr Span Directs FRIM	-	-	.05	11.10	-	-
Tchr Lang Unkn	-	-	.02	.10	.04	.13
Target Pupil Eng	.03	1.00	-	-	-	-
Tar Pup Eng Incorr	.03	3.00	-	-	-	-
Target Pupil Span	.20	3.86	.05	2.90	.17	1.11
Tar Pup Span Corr	-	-	.05	5.30	.01	8.00
Tar Pup No Response	.09	2.23	-	-	-	-
Other Pupil Eng	1.74	2.00	.20	1.49	.98	.89
Other Pup Eng Corr	.49	2.25	.35	3.04	.09	1.60
Other Pup Eng Incorr	.40	2.11	-	-	.03	2.00
Other Pup Eng Part Corr	-	-	-	-	.03	1.20
Other Pupil Span	.17	1.18	.69	1.60	4.06	1.17
Other Pup Span Corr	.03	2.10	1.21	4.41	.09	1.96
Other Pup Span Incorr	-	-	.05	3.65	-	-
Other Pup Span Off Task	-	-	.02	2.30	.01	5.10
Other Pup Span Unk	-	-	-	-	.01	.10
Other Pup Span No Resp	.17	2.32	-	-	.01	.40

while the bilingual teacher had the highest rate of overall language behavior than the other two teachers.

The target pupils for the Spanish dominant teacher had the highest rate of unmodified Spanish language responses at a rate of .20. While, the bilingual teacher had the highest rate of other pupils responding in Spanish in an unmodified mode (4.06).

Comparing the length of language behaviors, the Spanish dominant teacher had the lengthiest average explanation, questions, directs, praises and punishes in English during instruction with mean seconds of 10.39, 5.95, 4.85, 2.42, and 6.70, respectively. Interestingly, the English dominant teacher had the lengthiest explanations and informing in Spanish at 7.44 seconds and 5.10 seconds, respectively.

The Spanish dominant teacher gave lengthier questions (5.27 seconds), directions (9.37 seconds), and praises (3.00 seconds) in Spanish.

During free time, the English dominant teacher used Spanish at a higher rate and for lengthier responses than the other two teachers.

The English dominant teacher had more correct and incorrect Spanish language responses by the other observed pupils than the other two teachers with rates of 1.21 and .05, respectively.

A closer look at how these three teachers used the above mentioned language behaviors in sequence is presented in Table 7. Using a special computer program called PACK, each teacher's observed data was subjected to a "compressing" process which essentially analyzes and tabulates the data in terms of those teacher and pupil language behaviors that reoccur in groups of two or more. The program only selects these compressed clusters of language behaviors if they occur at a statistically significant rate. These clusters of compressed language events are presented according to the three different teachers.

TABLE 7
SUMMARY OF TOTALS, RATES, AVE. DURATIONS AND LATENCIES FOR PATTERNS OF TEACHER/PUPIL LANGUAGE INTERACTIONS FOR THREE TEACHERS WITH THREE DIFFERENT LEVELS OF LANGUAGE DOMINANCE

TEACH. LANG.	TOTAL RESP	RATE /MIN	AVE. DUR.	AVERAGE LATENCY	COMPRESSED EVENTS (PATTERNS OF RESPONSES)
SPAN. DOM.	18	0.51	12.1	3.4	T-SPA > T-SPA
	15	0.37	10.8	-5.2	T-SPA > OSC *
	12	0.30	8.1	3.5	T-SPA > OS
	9	0.22	12.3	-1.6	TSEXI > OSC
ENG. DOM.	9	0.22	6.6	-1.5	TSQI > OSC
	9	0.22	4.9	0.7	TSQI > OS
	8	0.20	5.6	2.0	T-SPA > T-SPA
	7	0.17	4.7	-3.1	TSSSL > OSC
	4	0.10	6.3	-0.4	OEC > TSEXI
	176	2.34	4.1	1.7	OS > T-SPA
	122	1.62	7.4	3.0	T-ENG > T-ENG
	105	1.40	9.5	3.0	T-SPA > T-SPA
	98	1.30	7.2	0.2	OS > T-SPA > OS > T-SPA
	37	0.49	4.1	1.7	OS > T-ENG
	34	0.45	19.2	2.9	T-ENG > T-ENG > T-ENG > T-ENG
	27	0.36	13.3	0.1	OS > T-SPA > OS > T-SPA > OS > T-SPA > OS > T-SPA
	26	0.35	25.6	5.6	T-SPA > T-SPA > T-SPA > T-SPA
	24	0.32	4.0	1.6	OS > TSQI
	23	0.31	4.6	2.9	OE > T-SPA
	18	0.24	6.4	4.7	OE > T-ENG
BILIN-GUAL	16	0.21	9.9	2.0	OS > T-ENG > OS > T-ENG
	14	0.19	5.2	1.9	OS > OS
	13	0.17	8.6	1.5	OS > T-SPA > T-SPA
	12	0.16	7.7	1.4	OE > T-SPA > OE > T-SPA
	11	0.15	5.8	-0.6	OS > T-SPA > OS
	11	0.15	11.0	1.4	T-SPA > T-SPA > T-SPA
	10	0.13	14.0	1.9	T-ENG > T-ENG > T-ENG
	9	0.12	7.3	-0.2	OS > TSQI > OS > TSQI
	9	0.12	11.1	0.8	OE > T-ENG > OE > T-ENG
	8	0.11	7.5	2.9	TSEXI > T-SPA
	8	0.11	3.8	2.4	OE > OE
	8	0.11	4.9	1.6	SS > TSQI
	7	0.09	13.9	4.6	T-ENG > T-ENG > T-SPA
	7	0.09	44.8	4.9	T-ENG > T-ENG > T-ENG > T-ENG > T-ENG > T-ENG > T-ENG > T-ENG
	7	0.09	21.2	0.4	OS > T-SPA > OS > T-SPA > OS > T-SPA > OS > T-SPA > OS > T-SPA > OS > T-SPA
	6	0.08	5.7	2.1	TSEXI > TSQI
	6	0.08	3.4	0.9	OS > TEQI
	5	0.07	17.9	2.7	OS > T-SPA > T-SPA > T-SPA

LEGEND OF EVENT SYMBOLS:

T-SPA = TEACHER SPANISH
OSC = OTHER PUPIL SPANISH CORRECT
OS = OTHER PUPIL SPANISH
TSEXI = TEACHER SPANISH EXPLAINS INSTRUCT.
TSQI = TEACHER SPANISH QUESTIONS INSTRUCT.
TSSSL = TEACHER SPAN. SPAN. SECOND LANG.
OEC = OTHER PUPIL ENGLISH CORRECT
OE = OTHER PUPIL ENGLISH
T-ENG = TEACHER ENGLISH
SS = TARGET PUPIL SPANISH
TEQI = TEACHER ENGLISH QUESTIONS INSTRUCT.
> = FOLLOWED BY

*EXAMPLE: T-SPA > OSC

English dominant teacher gave a Spanish language behavior which was followed by an other pupil correct Spanish behavior. This occurred 15 times at a rate of .37 times/min., lasting an average of 10.8 seconds with an average overlap between the two behaviors of 5.2 seconds.

A visual perusal of this Table very quickly indicates differences among the three teachers. The Spanish dominant teacher only had one pattern of language behavior during the observed time that consistently reoccurred enough to be classified as a true pattern. This pattern was simply the teacher giving a Spanish unmodified instruction followed by another Spanish unmodified instruction. This occurred 18 times at a rate of .51 per minute, lasting an average of 12.1 seconds. The average time between each of the individual behaviors was 3.4 seconds as indicated in the Average Latency column.

The English dominant teacher had eight clusters of language behaviors that qualified as language patterns. The highest pattern included a teacher Spanish language response followed by another pupil correct Spanish response. The lowest occurring pattern for this teacher was another pupil correct English response followed by a teacher explaining in Spanish during instruction.

The bilingual teacher had by far the greatest number of actual repeating language patterns. This would indicate that this teacher during observation used a set of highly mastered interaction patterns during her instructional strategies. Note that several of her patterns are quite lengthy in terms of the number of different individual language behaviors making up the patterns.

Patterns of teacher/pupil language interactions are clearly shown by the PACK Procedure.

bilingual teacher was "OS > T-SPA" or other pupil speaking in Spanish followed by a teacher responding in Spanish. It will be noted that this bilingual teacher had this pattern occur 176 times, with a rate of occurrence of 2.34 times per minute. A longer string of this same pattern occured with the same teacher 27 times.

Another interesting pattern of this teacher is "OS > T-ENG OS > T-ENG" or other pupil speaking Spanish followed by the teacher speaking English. It could be interpreted that the teacher was speaking English to Spanish dominant pupil.

The possibilities for teacher/pupil language pattern identification with PACK becomes readily apparent as one studies Table 7.

Summary

The preceding data clearly indicated that different language interactions patterns did exist between the three different teachers reported in this section of the study. The observed bilingual teacher showed a greater variety of consistent patterns, whereas the Spanish dominant had the least consistency in her language usage for instruction.

The special computer program PACK offers the researcher a unique tool in accurately identifying patterns of teacher/pupil language usage.

DISCRIMINANT ANALYSIS OF INSTAT DATA

Three teachers, one from each of three districts, were compared by means of discriminant analysis. In the study, these teachers were numbered 2, 4, and 5. The discriminant analysis is presented here as an illustration of one method of comparing teachers, districts, or other groupings.

The discriminant analysis had two objectives: (1) to identify which of the variables contributed to separation of the three teachers, and (2) to examine the pattern of separation achieved by the discriminant functions. The discriminant analysis was followed by a classification analysis to determine what percentage of the observation times could be classified into correct teacher groupings.

The approach taken by discriminant analysis will now be briefly described. New variables called discriminant functions are created which maximally separate the three groups. These new variables take the form of linear combinations of the original variables:

$$y = a_1 z_1 + a_2 z_2 + \ldots a_p z_p \qquad (1)$$

where the z's are the standardized values (z scores) of the p variables chosen to enter the analysis. There will usually be more than one discriminant function since one new dimension may not extract all the available information for separating groups.

The coefficients $a_1 a_2 \ldots a_p$ can be interpreted as showing the relative importance of each variable in the discriminant function. The number of variables, p, can usually be fewer than the full set of

variables, i.e., some of the variables will be found to contribute very little to the discriminant function and can be omitted.

Classification functions are distinct from discriminant functions and are designed to maximize the probability of correctly classifying the observation cases into the appropriate teacher groups. For a given observation case, the (posterior) probability of belonging to each group is obtained and the case is assigned to the group for which its probability is highest. This analysis is carried out with the same p variables which are selected for the discriminant analysis.

Seventeen variables were selected from the 94 available for input into the discriminant analysis. There were 15 observation cases for teacher 2, 18 for teacher 4, and 10 for teacher 5, making a total of 43. This is admittedly a small number of observations and one would typically expect to use more.

In order to determine which of the seventeen variables were most useful for discrimination, a stepwise discriminant analysis was performed. The stepwise procedure seeks to determine which variables can be eliminated with least loss of discriminating power. It was found that with eight variables 90.7 percent of the observation cases were still classified correctly.

Two discriminant functions were obtained in the stepwise procedure. The standardized coefficients for these two discriminant functions are given in Table 8. These correspond to the coefficients a_1 a_2. . . a_p in equation (1). Each discriminant function can be used to get a score for each observation case. The scores for each teacher can be compared.

TABLE 8

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

Variable	Function 1	Function 2
Null time	-.79	.40
T- English Explains	.29	.04
T- Spanish	-.35	.32
Other Pupil English	1.02	.28
Other Pupil Spanish	.49	-.35
Other Pupil Sp. Correct	.45	-.48
Pad 1 Pupil Understands	-.18	.41
Pad 4 Pupil Understands	-.18	-.47

It is interesting to note variables entering in which are associated with Pads 1 and 4. These two particular pads are not comparable from one classroom to another since they were operated by different students. These two variables thus represent all the student pad data in a random way and have no intrinsic meaning of their own. The fact that they entered into the model shows that student response data is a significant contributor to distinguishing teachers.

Using equation (1) the two discriminant scores were calculated for each of the 43 observation cases. The average scores were found for the three teachers. The means of these are given in Table 9 and are plotted in Figure 10.

TABLE 9

AVERAGE DISCRIMINANT SCORES

Teacher	Function 1	Function 2
T2	.97	-.57
T4	-.95	-.29
T5	.24	1.36

FUNCTION 1

T4					T5			T2		
-1.0	-.75	-.50	-.25	0	.25	.50	.75	1.0	1.25	1.4

FUNCTION 2

		T2	T4							T5
-1.0	-.75	-.50	0.25	0	.25	.50	.75	.75	1.0	1.25	1.4

Figure 10

Average Discriminant Scores by Teachers

In Table 9 and Figure 10 it is apparent that the first discriminant function produces a major separation between Teacher 2 and Teacher 4. The second function separates Teachers 2 and 4 from Teacher 5.

Using the same eight variables as in Table 8, classification functions were computed. This was done using all 43 observation cases correctly grouped into the three teachers. The same 43 observation cases were then resubmitted without teacher identity to determine how well the classification functions could correctly assign each observation case to the right teacher. The results are given in Table 10.

TABLE 10

PREDICTED TEACHER IDENTITY FOR 43 OBSERVATION CASES

	Predicted Teacher			
Actual Teacher	T2	T4	T5	Total
Teacher 2 (T2)	14	0	1	15
Teacher 4 (T4)	1	15	2	18
Teacher 5 (T5)	0	0	10	10

The total number of cases correctly classified can be seen in Table 10 to be 14 + 15 + 10 = 39 which is 90.7 percent of the 43 observation cases. Of the 15 observation cases from Teacher 2, one was misclassified as belonging to Teacher 5. Of the 18 cases from Teacher 4, one resembled the profile of Teacher 2 and two resembled Teacher 5. For Teacher 5, all 10 observation cases were classified correctly.

In a study of this type, the rather high percentage of correct classifications might be questioned, since the same observations being classified had been used earlier to obtain the classification functions. The classification functions were thus fitted to the very data they were expected to classify. In previous discriminant analyses using TICOR data, however, the percentage of correct responses was found to drop very little when new data were submitted to the classification functions.

The remarkably high percentage of correct classifications in this case (90.7) may in fact be an artifact of this small data set. Previous discriminant analyses of TICOR data have typically yielded outcomes in the 70's. However, these results illustrate rather dramatically how the TICOR produces objective, quantitative data which establish differences among teachers and help pinpoint the nature of these differences.

The differences between pairs of teachers or other groupings can be examined further by means of a profile analysis which will be discussed next. This procedure was developed to take advantage of the continuous type data provided by TICOR.

COMPARISON OF PROFILES

A new procedure has recently been developed at BYU for comparing the profile of a teacher or group of teachers with the profile of another teacher or a group of teachers. A teacher's profile can also be compared against a standard or normative profile. A normative profile could be established describing the characteristics or patterned teaching behavior of teachers who have effectively reached the goals of a bilingual teacher preparation program. The profile for any given teacher could then be compared with this normative profile. The areas where improvement is needed would become immediately obvious. Such evaluative capabilities would have great potential impact on an inservice program.

The profile for a teacher or group is the pattern of classroom interaction as recorded through TICOR for the variables of interest. The profile is measured by calculating the average for each variable of interest. The profile is measured by calculating the average for each variable over all the observation cases for the group. In order to make more meaningful comparisons, the variables are scaled so that each represents the percentage of time spent on the corresponding behavior.

There were 94 variables observed in the INSTAT or instructional interaction phase. Since an analysis of that large a variable set would be confusing and also because several of them did not occur, we selected 12 variables to use in the profile comparison. These variables were selcted for (1) interest, (2) high frequency of occurrence, and (3) lack of redundance. The third selection criterion is applied by the program itself since redundant variables make it impossible to invert a certain matrix whose inverse was vital to the analysis. A

screening procedure was therefore devised to detect and eliminate the redundant variables in each sample.

To illustrate the procedure, teachers number 4 and 5 were selected for comparison. The analysis begins by simultaneously comparing the levels (percent of time spent on each) on all 12 variables. This can be done using a T^2 statistic which in this case has a value of 47.1 which is statistically significant at the .04 level.

The profiles for the 12 variables are given in column (1) and (2) of table 11. Some noticeable differences between the two individuals can be seen on several variables. However, these differences should be investigated further since the overall profile difference was just barely significant.

The 12 variables may be examined in two ways for their contribution to divergence of the profiles: (1) individually and (2) in combination with the others. The second approach provides information beyond the first because the variables are correlated and thus do not act independently.

The individual variables can be checked for significance by two techniques, one of which ignores the other variables while the other takes into account the other variables (11 in this instance). The first method may be performed using ordinary t-tests. The significance level associated with a t-test, however, is valid only if it is the sole test of significance for differences between means to be performed. As the number of tests increases, the chance of spuriously delcaring one or more variables to be significant increases sharply. On the other hand, the multivariate tests designed to overcome this problem are necessarily conservative and will sometimes fail to detect significant variables.

TABLE 11

A COMPARISON OF PROFILES FOR TEACHER 4 AND TEACHER 5

Variable	(1) Teacher 4	(2) Teacher 5	(3) t-value	(4) Ordinary p-value	(5) Multi-variate p-value	(6) Discriminant Function Coefficients
Null time	.369	.286	1.47	.154	.999	1.000
T-English	.088	.013	3.25	.0032	.819	.171
T-English-Questions	.0085	.0008	5.66	<.00001	.138	.006
T-Spanish	.136	.103	4.75	.00006	.325	.146
T-Spanish-Explains	.0095	.036	-1.00	.326	1.000	.653
T-Spanish-Questions	.017	.024	- .66	.517	1.000	.224
Other pupil-English	.022	.013	.62	.541	1.000	.383
Other pupil-Spanish	.086	.046	10.01	<.00001	.0009	.060
O-P-Spanish-Correct	.0025	.066	-5.17	.00002	.223	.492
Pupil understands	.106	.183	-3.02	.0056	.876	.565
Pupil does not understand	.069	.100	-2.17	.039	.988	.419
MASTER KEYPAD QUESTION	.041	.064	-5.24	.00002	.209	.281

The t-tests for each variable are given in column (3) of Table 11 and their associated p-values in column (4). As pointed out previously, however, these are somewhat liberal since they do not take into account the fact that several (eleven) t-tests have been made.

The multivariate test uses the same t-statistic, but a new significance level is computed to allow for the 11 tests that have been made. The new p-values are given in Table 11, column (5). Since the multivariate p-values are somewhat conservative, while the ordinary p-values are more liberal, several contrasting conclusions will be noted where the first p-value indicates significance and the second does not. Such results should be considered inconclusive until further information becomes available. In the cases where both p-values indicate significance or lack of it, the conclusions can be considered to be well established. Thus, in column (5) only "other pupil-Spanish" exhibits a sufficiently small p-value to be termed significant.

It is important to examine the contribution of the variables in combination with each other since the variables are significantly correlated in this case. The performance of the variables in combination was assessed by means of a discriminant function which takes into account the inter-correlations among the variables. The size of each coefficient indicates the contribution of that variable (in the presence of the others) in distinguishing the two profiles. These coefficients are given in column (6) in Table 11. They have been scaled so that the largest is one (1). In some instances they tell a different "story" from the significance tests which treat the variables separately.

In this context, the variable "Null Time" contributes most to distinguishing the two teachers. The next most important variable is T-Spanish-Explains followed by Pupil Understands. It should be noted that these data presented here represent a sample of the normative profile procedure and in no way are they meant to be representative of a profile of effective bilingual instruction.

In assisting the decision maker, both the discriminant analysis and the normative profile analysis findings become valuable decision making tools. From the discriminant procedure the decision maker can determine the degree of difference between two observed groups including those critical variables that constitute differences. If the differences are significant one can utilize this information to provide inservice support for bilingual faculty. The normative profile analysis is designed to compare the performance of an individual teacher to an empirical standard. This procedure allows the decision maker to maintain a standard of effective performance from year to year.

ANALYSIS OF EQUAT DATA

PART I

A critical question to consider in the bilingual classroom setting deals with the equality of teacher attending time among the different ethnic pupils in her classroom for this study. The TICOR recorder was used in a unique manner to measure the number of seconds the observed teachers used each time they attended to Anglo, Hispanic and Black children who were identified as being of high, average, and low abilities within each of the three ethnic groups.

Table 12 presents the same number of seconds the observed teachers from the three school districts used each time they attended to the above groups of pupils. Also, this table presents the standard deviation for each of these means in order to present the reader with an insight as to the consistency of the teachers' attending time with the various pupil groups.

Considering the overall grouping of the pupils by the three ethnic groups, the reader will note that the observed teachers spent an average of 7.2 seconds each time they attended to Anglo pupils, 6.6 seconds each time they attended to Black pupils, and 6.1 seconds with Hispanic pupils. Though the average length of the teachers' attention behaviors was slightly larger for Anglo pupils, note that they were also more variable in their length of attending with this group.

Considering all pupils in the study in terms of their sex category, it can be noted in Table 12 that the observed teachers within

TABLE 12

SUMMARY MEANS AND STANDARD DEVIATIONS OF TIME TEACHERS ATTENDED TO ANGLO, HISPANIC, AND BLACK, MALE AND FEMALE PUPILS ON THREE ABILITY LEVELS

STUDENT GROUP	$\bar{X}$ TIME (SEC.)	STAND. DEV.
Anglo	7.2	12.2
High Ability	6.1	9.4
Male	6.3	8.9
Female	5.9	10.2
Average Ability	7.6	12.0
Male	8.0	12.1
Female	7.1	11.9
Low Ability	8.0	16.4
Male	11.1	24.9**
Female	6.5	10.0
Latin	6.1	7.7
High Ability	4.1	4.8
Male	3.1	0.9
Female	4.4	5.6
Average Ability	6.8	7.7
Male	4.1	4.1
Female	7.7	8.4
Low Ability	5.9	8.8
Male	2.0	1.8
Female	11.7	11.5
Black	6.6	9.2
High Ability	10.3	11.7
Male	2.4	1.0
Female	12.3*	12.4
Average Ability	3.0	3.5
Male	.8	1.0
Female	6.1	3.4
Low Ability		
Male	NONE	NONE
Female		

STUDENT GROUP	$\bar{X}$ TIME	STAND. DEV.
All Males	7.0	12.4
All Females	7.0	10.5
All High Ability	6.2	9.3
All Average Ability	7.3	11.2
All Low Ability	7.5	14.7

LEGEND:

* Observed teachers on the average spent 12.3 seconds with female Black pupils of high ability each time they attended to them, which was the highest average compared to all other groups.

** Observed teachers were more variable in their length of attending time with low ability male Anglo pupils compared to all other groups.

the three districts did not show differences in the length of their attending to male or female pupils. The standard deviation for these two groups indicated that the observed teachers tended to vary the length of their attending behaviors more for male pupils than for female pupils.

Dividing all observed pupils into the three groups of high, average and low ability, indicates that their teacher tended to spend lengthier time attending to the lower ability pupils (7.5 seconds) and the next lengthiest with average ability pupils (7.3 seconds) and the shortest with the high ability pupils (6.3 seconds). It is interesting to note that the variability in the length of these teacher attending behaviors was also highest for the low ability pupil and less variable for the high ability pupil.

A closer breakdown within each of the three ethnic groups gave some interesting information. Black female high ability pupils received the lengthiest teacher attention behaviors (12.3 seconds) across all groups, with Hispanic low ability females and Anglo low ability males receiving the next lengthiest teacher attention behaviors at 11.7 seconds and 11.1 seconds respectively.

On the other end of the spectrum, male Black average ability pupils had the shortest average attention time at .8 seconds. They were followed closely by Hispanic low ability male pupils (2.0 seconds), Black high ability males (2.4 seconds) and Hispanic male high ability pupils (3.1 seconds).

The variability in amount of time of each teacher attending behavior indicated the greatest variability with the Anglo low ability

male with a standard deviation of 24.9. The lowest variability occurred with the lowest attending times referred to above.

Summary

Clearly, these data indicate that the observed teachers use their attending behavior in different ways among ethnic groups of varying abilities and sexes.

The observed teachers tended to favor the Black females of high ability and the low ability Anglo males and low ability Hispanic female pupils.

Whereas, the data indicated that these same observed teachers tended to spend shorter attending times with the Black average and high ability males, and the Hispanic low and high ability males.

The differences between sexes tended to "wash out" as all the data are considered together. There is also a trend for the teachers to spend more time with the low ability pupils. Then the average and high ability pupils are attendended in that order.

ANALYSIS OF EQUAT DATA

PART II

Using the EQUAT procedure, it was possible to examine the variable of teacher equity from different points of view. Specifically, it was possible to answer a sample of questions generated from within the demographic orientation of these data.

1. What percentage of the pupils did the teacher attend?
2. How many times was a pupil contacted by his teacher?
3. What language stimulus did the teacher use when attending to an individual pupil?
4. At what distance did the teacher attend to a pupil?
5. When attending a pupil, was the teacher usually positive, negative, or neutral?
6. Did the teacher give preference to girls over boys in the number of times they were attended?
7. Did the teacher respond mostly to the aggressive students who demanded attention or did he also pay attention to the quiet ones?
8. How many times was the teacher forced to give attention to pupils who were off-task?
9. Did the teacher give preference to high-ability pupils, average ability pupils, or low ability pupils in dividing his attention?

Such questions can be answered on a group level or on an individual level. Furthermore, a single teacher may be compared with other individual teachers or with a group of teachers. Groups of teachers may be compared with other groups of teachers.

For this particular illustration, the above questions will be answered for teacher 211. The reader should note that these data

were taken from a small sampling, 108.44 minutes, and may not reflect a true assessment of this teacher.

1. What percentage of the pupils did Teacher 211 attend?

   There were 23 pupils enrolled. Of this total, the teacher attended to all but one pupil, number 8, during the 108.4 minutes of observation time, or a total of 96 percent of the pupils.

2. How many times was a pupil contacted by his teacher?

   The range for the 108-minute period was 0 to 35 times. The average number of times a pupil was contacted during the period was 13.

3. What language stimulus did the teacher use when attending to a pupil?

   Out of a total of 286 individual interactions with her pupils, she used an English stimulus 273 times, a Spanish stimulus four times and four times the stimulus used was undetermined. Hence her use of English was 95 percent when attending to an individual pupil.

4. At what distance did the teacher attend to a pupil?

   The teacher attended a total of 244 times when she was close to the pupil and 42 times when the pupil was at a distance. Thus, the usual pattern for this teacher was to be near the pupil when attending him. The teacher was near the pupil for 85 percent of the cases.

5. When attending a pupil, was the teacher usually positive, negative, or neutral?

   The teacher was considered to be neutral in her attention 272 times, negative 9 times or .05 times per minute, and positive only 5 times or .09 times per minute. Thus, her usual pattern (95 percent of the cases) was to be neutral.

6. Did the teacher give preference to girls over boys in the number of times they were attended?

   There were 11 boys and 12 girls in the class. The boys were attended 157 times and the girls 129 times. Thus, the boys were attended on the average 14.27 times and the girls 10.75 times. Teacher 211 did not give preference to the girls, instead, she gave it to the boys.

7. Did the teacher respond mostly to the aggressive pupils who demanded attention, or did she also pay attention to the quiet ones?

Only 56 of the 286 cases of teacher attending were initiated by the pupils themselves. So most of the time, 80 percent, she initiated the contact with the individual pupil herself.

The fact that there was a wide variance in the number of times that the teacher attended each pupil would indicate that she was not really trying to give all pupils equal time and attention. The number of contacts with a pupil was probably a matter of proximity, convenience, favoritism, or possibly to keep certain pupils on-task.

The last possibility is analyzed in the next question. The possibility of favoritism prompted a more careful analysis of the attention paid to pupils 15, 18, and 13, the three pupils who were attended the most. Pupil 15, attended the very most, was a boy of average ability. Fourteen out of 35 times he was off-task and had to be redirected by his teacher. Pupil 18, a girl of average ability, was attended to 26 times. She wasn't off-task at all and only once was her contact with the teacher self-initiated. So teacher favoritism is a definite possibility in her case. Pupil 13, a boy of average ability, was off-task 4 times out of 25. Twice he initiated contact with the teacher. But 19 times he was sought out by his teacher. So again, teacher favoritism is a possibility.

8. How many times was the teacher forced to give attention to pupils who were off task?

It has been mentioned already that the pupil who was attended the most was off-task a total of 14 out of 35 times. There were an additional 34 incidents of off-task behavior for a total of 48. This seems to be a fairly low percentage, only 17 percent of the total number of student interactions. Additional tabulation revealed that 15 of the total 23 pupils were off-task at least once so the problem was not isolated to only a few children.

9. Did Teacher 211 give preference to high ability pupils, average ability pupils, or low ability pupils in dividing her attention?

   There were 7 pupils of high ability in the class, 13 pupils of average ability, and 3 pupils of low ability. It was found that the teacher attended to the high ability pupils an average of 7.0 times. But she attended the average ability pupils an average of 14.92 times, and the low ability pupils an average of 14.33 times. Thus, it seems clear that Teacher 211 did not attend the high ability pupils as much as she did the average and low ability students.

Such data as these can be used to identify the learning styles and teaching strategy that exists within a given classroom or in a given classification of teachers.

ANALYSES OF THE MOBAT DATA

The purpose of the MOBAT procedure was to monitor the teacher in her mobility within the classroom's 12 areas, while attending to individual pupils. The procedure allows for the MOBAT observer to identify the duration with which the teacher attends to an individual pupil plus the room position of the attending teacher. Other information obtained includes the frequency of teacher attending in Spanish and English and the forms of the attending such as off-task, non-verbal, positive and negative.

Table 13 provides a summary of MOBAT data taken from a 97.36 minute segment of observation on teacher 211. The summary part of the table shows that this teacher made 177 contacts with individual pupils from all 12 positions, with 41 of these contacts being made to female pupils while in the seating areas and 50 contacts with male pupils. The average duration the teacher attended a pupil was 30 seconds per pupil contact.

Teacher 211 provided positive attention at a rate of 6.5 times in a ten minute period and negative attention at a rate of 2.8 times in the same period. Off-task attention had only one occurrence during that time while non-verbal attending had a rate of 1.7 time in a 10 minutes period.

The teacher had a high preference for area 4, 7.4 in 10 minutes, and a low preference for areas 3, 5, 6, 8, 9 and desk. In attending to female pupils, area 4 had the highest rate of 1.0 times per 10-minutes period, with a low in all other areas (except area 1). Male attending showed a preference for areas 2 and 9 with a rate of 1.0 and 0.9 in a 10-minutes, period, respectfully.

TABLE 13

MOBAT SUMMARY OF TEACHER 211

BILINGUAL MOBAT STUDY

DATE: 4/ 25 TEACHER:211 MINUTES OF OBSERVATION: 37.39
TOTAL SECONDS TIME: 5841.5 NULL TIME: 517.3 TIME UTILIZED: 5324.2

EXPLANATION	NUM RESP	RESP /MIN	STAND DEV	% RESP	DURATION	MEAN	STAND DEV	% DUR
NULL TIME	191.	1.88	1.45	26.74	517.3	2.66	11.54	8.86
TEACHER LOCATION	177.	1.82	1.34	25.14	5316.5	30.04	45.23	91.01
FEMALE LOCATION	31.	0.42	0.68	4.06	16.3	0.40	0.93	0.28
MALE LOCATION	50.	0.51	0.67	7.38	19.1	0.38	0.53	0.33
ATTENDING	228.	2.38	2.05	33.66	438.6	1.92	10.15	7.51
TOTAL RESPONSES:	677.	6.95	5.20	100.00	6307.4	9.32	27.53	

EXPLANATION	NUM RESP	RESP /MIN	STAND DEV	% RESP	DURATION	MEAN	STAND DEV	% DUR
NULL TIME	191.	1.96	1.45	26.74	517.3	2.66	11.54	8.86
TEACHER DURATION FRONT	18.	0.18	0.34	2.66	792.9	44.05	53.52	13.57
TEACHER DURATION REAR	1.	0.01	0.10	0.15	6.7	6.70	0.00	0.11
TEACHER DURATION AREA 1	25.	0.26	0.66	3.69	369.2	14.77	21.02	6.32
TEACHER DURATION AREA 2	12.	0.12	0.43	1.77	363.7	30.31	24.57	6.23
TEACHER DURATION AREA 3	5.	0.15	0.26	0.74	122.5	24.50	24.39	2.10
TEACHER DURATION AREA 4	72.	0.78	0.42	10.64	2449.5	34.02	51.30	41.93
TEACHER DURATION AREA 5	9.	0.09	0.32	1.33	113.0	12.56	12.61	1.93
TEACHER DURATION AREA 6	7.	0.07	0.29	1.03	101.5	14.50	9.54	1.74
TEACHER DURATION AREA 7	21.	0.22	0.59	3.10	738.9	35.19	50.14	12.65
TEACHER DURATION AREA 8	5.	0.05	0.24	0.74	197.1	39.42	43.56	3.37
TEACHER DURATION AREA 9	2.	0.02	0.14	0.30	61.5	30.75	3.65	1.05
FEMALE AREA 1	4.	0.04	0.27	1.18	1.5	0.10	0.09	0.03
FEMALE AREA 2	4.	0.04	0.24	0.59	0.6	0.15	0.05	0.01
FEMALE AREA 3	3.	0.03	0.17	0.44	0.4	0.13	0.05	0.01
FEMALE AREA 4	10.	0.10	0.33	1.48	2.3	0.23	0.09	0.04
FEMALE AREA 5	8.	0.08	0.24	0.59	6.1	1.53	2.04	0.10
FEMALE AREA 6	2.	0.02	0.14	0.30	0.6	0.30	0.20	0.01
FEMALE AREA 7	2.	0.02	0.14	0.30	0.2	0.10	0.00	0.00
FEMALE AREA 8	3.	0.03	0.17	0.44	3.9	1.30	1.70	0.07
FEMALE AREA 9	5.	0.05	0.22	0.74	0.7	0.14	0.05	0.01
MALE FRONT	3.	0.03	0.17	0.44	0.9	0.27	0.17	0.02
MALE AREA 1	5.	0.05	0.22	0.74	3.0	0.60	0.77	0.05
MALE AREA 2	10.	0.10	0.36	1.48	1.7	0.17	0.14	0.03
MALE AREA 3	4.	0.04	0.21	0.59	0.6	0.15	0.05	0.01
MALE AREA 4	9.	0.09	0.29	1.33	4.2	0.69	0.97	0.11
MALE AREA 5	5.	0.05	0.22	0.74	1.9	0.38	0.42	0.03
MALE AREA 6	6.	0.06	0.24	0.89	2.1	0.35	0.21	0.04
MALE AREA 7	3.	0.03	0.17	0.44	0.8	0.27	0.17	0.01
MALE AREA 8	2.	0.02	0.14	0.30	0.3	0.15	0.05	0.01
MALE AREA 9	3.	0.03	0.17	0.44	1.7	0.57	0.45	0.03
POSITIVE ATTENDING	63.	0.65	0.85	9.31	9.3	0.15	0.09	0.15
NEGATIVE ATTENDING	27.	0.28	0.59	3.99	4.1	0.15	0.14	0.07
NON-VERBAL ATTENDING	17.	0.17	0.47	2.51	90.9	5.35	4.90	1.54
OFF TASK ATTENDING	1.	0.01	0.10	0.15	0.1	0.10	0.00	0.00
FREQ ATTENDING ENG.	118.	1.21	1.02	17.43	283.8	2.41	13.11	1.44
FREQ ATTENDING SPAN.	2.	0.02	0.14	0.30	50.4	25.20	24.90	0.95

The teacher had an average duration of 44.05 seconds while attending from the front of the room, with less time being afforded in all other areas.

It must be remembered that this was a very limited sample and cannot be looked upon as being representative of her true preference both by area and by sex.

Table 14 provides a graphic grouping of Table 13.

Using the demographic component of the EQUAT data, a greater degree of analyses can be made once true teacher preferences have been established. This would be useful as a tool to investigate teacher mobility and preferences to the learning outcomes of individual pupils.

In Table 15, a breakdown has been provided on MOBAT by language dominance. These data are representative of three teachers, one from each district.

Summary

These data show that the MOBAT procedure for looking at teacher mobility and attending can identify teacher preferences towards interacting from various positions within the room and preferences by sex. Although these data represent a limited sample of teacher mobility, they do offer the opportunity to investigate the correlation between teacher mobility and other variables, including attention and learner outcomes.

A more realistic procedure to a MOBAT investigation would be to monitor the teacher randomly over days and subject matter being taught in order to ascertain her degree of consistency. This would need to be done before any generalizations could be made to learner behavior.

TABLE 14

MOBAT DURATION AND RATE PER MINUTE

OF ATTENDING BY AREAS AND SEX

Front					
T. Att. R/M	0.18				
Mean Dur.	44.05				
Male R/M	0.03				
Female R/M					
Area 1		**Area 2**		**Area 3**	
T. Att R/M	0.26	T. Att. R/M	0.12	T. Att. R/M	0.05
Mean Dur.	14.77	Mean Dur.	30.31	Mean Dur.	24.50
Male R/M	0.05	Male R/M	0.10	Male R/M	0.04
Female R/M	0.08	Female R/M	0.04	Female R/M	0.03
Area 4		**Area 5**		**Area 6**	
T. Att R/M	0.74	T. Att. R/M	0.09	T. Att. R/M	0.07
Mean Dur.	34.02	Mean Dur.	12.56	Mean Dur.	14.50
Male R/M	0.09	Male R/M	0.05	Male R/M	0.06
Female R/M	0.10	Female R/M	0.04	Female R/M	0.02
Area 7		**Area 8**		**Area 9**	
T. Att. R/M	0.22	T. Att. R/M	0.05	T. Att. R/M	0.02
Mean Dur.	35.19	Mean Dur.	39.42	Mean Dur.	30.75
Male R/M	0.03	Male R/M	0.02	Male R/M	0.03
Female R/M	0.02	Female R/M	0.03	Female R/M	0.05
Back		**Desk**			
T. Att. R/M		T. Att. R/M	0.01		
Mean Dur.		Mean Dur.	6.70		
Male R/M		Male R/M			
Female R/M		Female R/M			

TABLE 15

A MOBAT COMPARISON OF AVERAGE DURATION OF PUPIL ATTENTION ON THREE TEACHERS BY LANGUAGE DOMINANCE

		Language Dominance		
	Region	English	Spanish	Bilingual
	Front	42.1 (30)	50.0 (47)	37.1 (78)
	Back	-	-	-
	Desk	-	-	6.7 (1)
Front Seating	Area 1	18.1 (14)	19.2 (2)	14.0 (44)
Front Seating	Area 2	29.3 (5)	35.4 (1)	17.7 (45)
Front Seating	Area 3	26.4 (4)	1.3 (1)	16.8 (11)
Middle Seating	Area 4	19.8 (30)	5.95 (2)	34.0 (72)
Middle Seating	Area 5	26.7 (2)	5.1 (2)	10.2 (13)
Middle Seating	Area 6	7.4 (2)	23.9 (3)	12.4 (9)
Back Seating	Area 7	25.5 (25)	13.6 (4)	36.2 (38)
Back Seating	Area 8	18.1 (3)	1.8 (3)	23.3 (9)
Back Seating	Area 9	20.3 (4)	9.1 (6)	23.3 (5)
	Average	26.9 (119)	37.1 (71)	27.2 (325)

(Number of observational events in parentheses)

SUMMARY OF EQUAT AND MOBAT DATA

Tables 16-20 summarize some of the Equality of Attention and Teacher Mobility data for all teachers in the sample. They illustrate some of the comparisons that can be made from this form of TICOR data. In a full scale analysis, many patterns and underlying constructs would be extracted from the data and statistical tests of significance would be performed.

In Table 16, two districts are compared as to equality of attention by sex of the students. The overall average duration of attention to the two sexes happened to be the same (7.02 seconds). Each district showed little deviation from an equal division of attention, although the two districts differed from each other in average duration of attention (9.61 for Salt Lake and 4.86 for Weber).

TABLE 16

AVERAGE DURATION OF ATTENTION TO MALE AND FEMALE PUPILS IN SALT LAKE AND WEBER DISTRICTS

	District		
Sex	Salt Lake	Weber	Average
Male	9.15 (157)	4.85 (154)	7.02
Female	10.17 (129)	4.86 (158)	7.02
Average	9.16	4.86	7.02

(Number of observational events in parentheses)

In Table 17, the same two districts are compared for equality of attention to ethnic groups. In Salt Lake, the average duration of attention was about equal for the Anglo and Hispanic groups. The number of times attention was given to Hispanic students was much less, however. This would have to be evaluated in terms of proportion of Hispanic students, ability distribution, etc. In the Weber District the average time spent with Hispanic students is less than for the other two groups. Again, other factors should be considered in drawing conclusions from this comparison.

TABLE 17

AVERAGE DURATION OF ATTENTION TO ETHNIC GROUPS IN SALT LAKE AND WEBER DISTRICTS

Ethnic Group	District		Average
	Salt Lake	Weber	
Anglo	9.00 (237)	5.09 (262)	7.23
Latin	9.69 (49)	3.23 (60)	6.13
Black	(0)	6.60 (20)	6.60
Average	9.61	4.86	7.02

(Number of observational events in parentheses)

In Table 18, the two districts are compared for equality of attention to pupil ability groups. In Salt Lake, the average duration of attention increases with decreasing ability as might be expected (from 7.19 seconds for the high ability group to 13.45 seconds for the low ability group). However, in Weber, the reverse is true; the average attention time decreases with decreasing student ability (from 5.76 seconds for the high group to 4.02 seconds for the low group). Such a trend, if it were based on sufficient data, would call for further investigation.

TABLE 18

AVERAGE DURATION OF ATTENTION ACCORDING TO PUPIL ABILITY IN SALT LAKE AND WEBER DISTRICTS

	District		
Ability	Salt Lake	Weber	Average
High	7.18 (49)	5.76 (129)	6.15
Medium	9.37 (194)	4.45 (138)	7.32
Low	13.45 (43)	4.02 (75)	7.46
Average	9.61	4.85	7.02

(Number of observational events in parentheses)

In Tables 16, 17, and 18, the two districts are compared with regard to sex, ethnic group and ability respectively. Table 19 gives a three-way summary of average duration of attention according to ability, ethnic group and sex. The data from the two districts is combined which permits comparisons across the levels of the other three variables.

TABLE 19

AVERAGE DURATION OF TEACHER ATTENTION IN SECONDS
BY ABILITY, ETHNIC GROUP, AND SEX

Ethnic	Ability						Average	
	High		Medium		Low			
	Male	Female	Male	Female	Male	Female	Male	Female
Anglo	6.26 (85)	5.89 (67)	8.01 (152)	7.08 (109)	11.11* (28)	6.54 (58)	7.78	6.61
Hispanic	3.10 (4)	4.41 (12)	4.06 (15)	7.66 (46)	2.02* (19)	11.68* (13)	2.94	7.85
Black	2.40* (2)	12.26 (8)	.77* (6)	6.10 (4)	(0)	(0)	1.45	10.21
Average	6.03	6.27	7.42	7.22	7.44	7.48	7.02	

(Number of observational events in parentheses)

The asteristics on Table 19 indicate what appears to be a rather severe inequity in amount of time spent by teachers with pupils within the 3 L.E.A. centers. Had a longer observation period been provided for each L.E.A. it would have been possible to identify the apparent reason behind the inequity of teacher attending behavior.

It is suggested, that such data as these can be of immeasureable value to evaluators and administrators in helping them predict average scores for a given graph of students as a function of the teaching environment.

TABLE 20

MOBILITY OF TEACHERS IN SALT LAKE AND WEBER DISTRICTS

Area	District		Average
	Salt Lake	Weber	
Front	48.40 (65)	37.43 (90)	42.03
Desk	6.70 (1)	(0)	6.70
Area 1	15.10 (27)	15.20 (33)	15.16
Area 2	30.70 (13)	15.34 (38)	19.26
Area 3	20.63 (6)	16.90 (10)	18.30
Area 4	33.26 (74)	19.87 (30)	29.40
Area 5	11.20 (11)	12.22 (6)	11.56
Area 6	17.32 (10)	6.22 (4)	14.15
Area 7	31.74 (25)	30.40 (42)	30.90
Area 8	25.34 (8)	9.64 (7)	18.01
Area 9	14.54 (8)	14.47 (7)	14.51
Average	32.07 (248)	25.33 (267)	28.57

(Number of observational events in parentheses)

In Table 20 a comparison of teacher mobility is made between Salt Lake and Weber Districts. The average time in seconds spent at possible locations in the classroom is given along with the number of times the teachers were observed at the location. The front of the room with the main chalkboard and the teacher's desk are comparable from one classroom to another. The back of the room was never used by either of the two districts. The other nine areas form a grid covering all the student seating areas and are not strictly comparable from one class to another. Thus, it may not be meaningful to compare the average time

spent in Area 2 in Weber (15.34). Perhaps a useful comparative device here would be a measure of uniformity across the nine areas.

POSSIBLE EXTENSIONS OF THE PRESENT DATA

Demographic Data

During the present pilot TICOR assessment into bilingual programs in the Utah area, demographics were collected that helped describe both teachers and students in project classrooms. Teachers were described in terms of their ethnicity, language dominance, sex, grade and/or groups they taught, and their geographic location (school district). Other data that would more completely describe the teachers, such as years and kinds of experiences, could also be included in future studies. Pupils were described by their ethnicity, country of birth, language dominance as estimated by the teacher, scholastic ability as estimated by the teacher, sex and seat location in the classroom. Other demographics describing the pupil population could be collected in future studies. For instance, it is possible to collect teacher estimates of the language dominance and the scholastic ability of all the students in the classroom to add to that hard data from achievement and language testing for six or more pupils in the classroom. Since pupils are identified individually in the data bank, it would then be possible to check the reliability of teacher estimates against actual measures and if the correlation were found to be high, interpretations and implications of the data could then be generalized to the whole of the pupil population.

In describing the ethnicity of both teachers and pupils, this report categorized participants as Anglo, Hispanic, and Black. Additional

ethnic categories could be added in future studies as needed. Language dominance of teachers was described as being English, bilingual or Spanish. Again, additional categories could be added for future studies where other languages and dialects might be involved.

Relation of Demographics to Study Variables

As described earlier, each of the three major studies INSTAT, EQUAT, and MOBAT collect and organize data unique to themselves. This means, then, that demographic information relates differently to each of the studies providing opportunities for a variety of different questions to be researched. In the three Tables that follow, Tables 21, 22, and 23, demographic data are compared with the study variables for each of the three major studies. Even a superficial glance at the matrices of these tables will reveal the comprehensive nature of TICOR data. Once data are collected through TICOR, it is possible to ask virtually thousands of research questions of the same data base since variables in the data are available for individual, paired, and multivariate analyses. For example, in Table 21 labeled "INSTAT", it is possible to compare the teacher behavior of Hispanic teachers in explaining concepts, asking questions, providing praise or punishment, with Anglo teachers. Other questions could be researched regarding the teacher's use of language in his/her methodologies. Patterns of pupil-teacher interaction can also be captured and analyzed according to language usage. The variation of the INSTAT study called INSTAT: PACK could also reveal commonly occurring, chained behavior patterns related to language usage. Other variables that could be studied

TABLE 21

DEMOGRAPHICS

STUDY: LNSIAI

Pupil									Teacher			
Seat Location	Sex	Measured Ability	Teacher Estimated Ability	Measured Dominance	Teacher Estimated Dominance	Country Birth	Ethnicity	Location	Grade	Sex	Language Dominance	Ethnicity
Front Back Near desk Sectors 1	Male Female	High Medium Low	High Medium Low	English Bilingual Spanish	English Bilingual Spanish	US Mexico S.A Other	Anglo Hispanic Other	Region? District? City?	K ↓ 12	Male Female	English Bilingual Spanish	Anglo Hispanic Other

STUDY VARIABLES

ENGLISH

Teacher Explains
Teacher Questions/Instructs
Teacher Praises/Instructs
Teacher Punishes/Instructs
Teacher Informs
Teacher Explains Routine
Teacher Questions Routine
Teacher Directs Routine

SPANISH

Teacher Explains
Teacher Questions/Instructs
Teacher Praises/Instructs
Teacher Punishes/Instructs
Teacher Informs
Teacher Explains Routine
Teacher Questions Routine
Teacher Directs Routine

TABLE 22

DEMOGRAPHICS

Pupil								Teacher				
Seat Location Front Back Near desk Sectors 1	Sex Male Female	Measured Ability High Medium Low	Teacher Estimated Ability High Medium Low	Measured Dominance English Bilingual Spanish	Teacher Estimated Dominance English Bilingual Spanish	Country Birth US Mexico S.A Other	Ethnicity Anglo Hispanic Other	Location Region? District? City?	Grade K 12	Sex Male Female	Language Dominance English Bilingual Spanish	Ethnicity Anglo Hispanic Other

STUDY: EQUAL

STUDY VARIABLES
- Attention to Individual
- Student Initiated
- Attended in Spanish
- Attended in English
- Positive Attention
- Negative Attention

TABLE 23

DEMOGRAPHICS

STUDY: MORAL

Pupil								Teacher				
Seat Location: Front, Back, Near desk, Sectors 1	Sex: Male, Female	Measured Ability: High, Medium, Low	Teacher Estimated Ability: High, Medium, Low	Measured Dominance: English, Bilingual, Spanish	Teacher Estimated Dominance: English, Bilingual, Spanish	Country Birth: US, Mexico, S.A., Other	Ethnicity: Anglo, HiSpanic, Other	Location: Region? District? City?	Grade: K ↓ 12	Sex: Male, Female	Language Dominance: English, Bilingual, Spanish	Ethnicity: Anglo, HiSpanic, Other

STUDY VARIABLES
- Duration in an Area
Attending Females by Area
Attending Males by Area
Positive Attention
Non-Verbal Attention
Duration Attending in English
Duration Attending in Spanish

would include the rate and kind of teacher exchange by Hispanic male teachers with students of high, medium or low scholastic ability. These data that could then be compared with data for Hispanic female interactions with similar pupil types. Other data could reveal patterns of behavior for Anglo teachers dealing with the same pupil types.

INSTAT also collects data regarding the specific responses of individual pupils, whether they were correct, incorrect, unknown, no response was given, the pupil is off task, and so forth. Also, covert student responses solicited through the pupil response pads can be used to indicate whether or not he/she understood what was going on, whether or not he/she was thinking in Spanish etc. Pupil reactions, when compared with other study variables (such as the ethnicity of the teacher and the pupil's ability) could all be combined to answer still other research questions.

Questions that might be answered according to the Table 22 labeled EQUAT, could be related to the duration of teacher attention to individual pupils where the teacher is Anglo attending to Hispanic pupils or vice versa. Other questions could be asked in regards to the pupil's initiation of contact; do Hispanic pupils initiate contact with Hispanic teachers more frequently than with Anglo teachers? If pupils initiate contact in Spanish, does the teacher respond in English? Is positive attention given primarily in English with negative attention being provided in Spanish or vice versa?

Table 23 suggests the wide variety of research questions that could be asked using MOBAT data and comparing MOBAT variables with demographics. The teacher's behavior (such as his/her mobility throughout the classroom, amount of non-verbal attention, duration of attending in English or Spanish, etc.) could be compared with the teacher's ethnicity. Are Hispanic teachers much more non-verbal in their attention than Anglo teachers? If a Hispanic teacher is more mobile and more non-verbal in his behavior than Anglo counterparts, what effect does this have on low achieving Hispanic pupils? Does pupil scholastic ability and seating location in the classroom control or mandate certain teacher mobility patterns?

With just these few examples, it is apparent the data base collected by TICOR is comprehensive enough to answer literally thousands of valid research questions related to bilingual education. It should also be remembered that if TICOR data is collected from a large and relatively representative sample, such questions could be asked, reconfigured, and readdressed over and over again from the same data. The breadth of the data base provides for substantial data collection economies.

SPSS. TICOR data are also compatible with SPSS, a job control language, computer package. The acronym stands for "Statistical Package for the Social Sciences" and accurately describes its content. With SPSS the researcher can analyze data according to a variety of descriptive statistics, can cross-tabulate and look for measures of association, can perform bivariate analyses, regressions, correlations and can compare samples using the t-test. Since TICOR

data has been made compatible with SPSS, a number of research questions other than those suggested by the preceding three Tables are possible.

PACK. The PACK computer package designed specifically for TICOR data can be performed for each of the three major studies and describes the sequence and frequency of teacher behavior patterns. Data from TICOR processed according to PACK could answer questions regarding what kind of demographic student is being attended by, say, Hispanic teachers, what precedes that attention, what follows the attention, what is the series of events and their nature. Similar questions could be asked for Anglo teachers, or, for Anglo teachers working with low achievers, and so forth. A sample of the PACK analysis is reported on page 31 .

In all of these data the underlying assumption is, that if a substantial data base is collected and the right research questions asked, then it should be possible to describe the kind and degree of teacher behaviors that tend to produce desired results (in terms of student performance, motivation, etc.). If teacher behavior patterns can be identified whose imitation increases the probability of student success, then those patterns of behavior can become part of in-service and pre-service teacher education programs. This in turn would bring a greater degree of economy to all forms of bilingual training programs.